

LEONARDO DA VINCI'S *PARAGONE*

BRILL'S STUDIES IN INTELLECTUAL HISTORY

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VOLUME 25



LEONARDO DA VINCI'S
PARAGONE

*A Critical Interpretation with a New Edition
of the Text in the Codex Urbinas*

BY

CLAIRE J. FARAGO



E.J. BRILL
LEIDEN • NEW YORK • KØBENHAVN • KÖLN
1992

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Library of Congress Cataloging-in-Publication Data

Farago, Claire J.

Leonardo da Vinci's Paragone: a critical interpretation with a new edition of the text in the Codex Urbinas / by Claire J. Farago.

p. cm.—(Brill's studies in intellectual history, ISSN 0920-8607; v. 25)

Revision of author's thesis.

Includes bibliographical references (p.) and index.

ISBN 90-04-09415-6 (cloth)

1. Painting—Philosophy. 2. Codex Vaticanus Urbinas 1270.
3. Leonardo, da Vinci, 1452-1519—Aesthetics. 4. Ut pictura poesis (Aesthetics) I. Leonardo, da Vinci, 1452-1519. Trattato della pittura. 1991. II. Title. III. Series.

ND1140.F35 1991

750—dc20

91-17966

CIP

ISSN 0920-8607

ISBN 90 04 09415 6

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PRINTED IN THE NETHERLANDS

Dedicated to the memory of
PINKNEY L. NEAR
1927–1990
mentor and friend

If I did not entirely satisfy [the readers'] expectations, they should not blame [me] for daring to tackle such an important subject. If my natural ability (*ingenium*) could not complete what it was praiseworthy to undertake, they should remember that, in the case of the greatest subjects, it is customary to be praised for trying the most difficult things with good will. Perhaps there will be those who will amend my errors and who, in this preeminent and most worthy subject, will be of far greater assistance to painters than I. If such [successors] arise, I would entreat them over and over to undertake this task with a ready mind in which they exert their *ingenium*, and to write on this most noble art as elegantly as possible. I consider it a great pleasure to have taken the palm in being the first to put this most subtle art into writing. If I was not able to meet the expectations of the readers in completing this very difficult undertaking, then the nature (*natura*) of the undertaking, rather than I, must be blamed—for [nature] imposes the law that erroneous beginnings are unavoidable. They say that nothing is born perfect instantaneously. Yet, if those who follow me are superior in studiousness and *ingenium*, they perhaps will render this art of painting perfect and complete.

Leon Battista Alberti
On Painting, 1435

TABLE OF CONTENTS

Acknowledgments and Preface.....	xi
List of Illustrations	xvi
Abbreviations	xviii

PART ONE CRITICAL INTERPRETATION

1. The Paragone.....	3
The Term Paragone.....	8
The Manuscript Sources	14
Leonardo's Writings in the History of the Paragone	17
The Sixteenth Century	17
The Early Seventeenth Century	28
2. The Rivalry of the Arts in Leonardo's Time	32
The Formal Sources of Polemical Comparisons of the Arts.....	32
The Epideictic Tradition	33
The Ancient Agon and Medieval Poetic Contests ...	36
Rivalry of the Arts at the Sforza Court.....	40
Practice of the "Rival" Arts	47
The Oral Tradition	51
Renaissance Adaptations of Traditional Forms	61
The Substantive Sources of Polemics Comparing the Arts.....	62
Debates on the Classification of the Liberal Arts	64
Florentine Debates over the Status of Poetry.....	68
The Nature of Nobility	73
The Issue of Method	79
3. Leonardo's Defense of Painting.....	92
An Overview of Leonardo's Arguments.....	92
The Visual Force of Painted Images.....	94
The "Trattato Sequences": Apparent and Pictorial Color	99
"Bello Rilievo" and the Problem of Pupil Dilation	106
Principles of the Science of Painting: Treatment of Boundaries	110

On Leonardo's Contribution to Pictorial Perspective.....	114
4. Leonardo's Contribution to the <i>Paragone</i> Tradition.....	118
The Status of the Sixteenth-Century Artist.....	119
Epistemological Conflicts: Incompatible Paradigms of Art	129
The Status of the New Productive Arts.....	137
Postscript.....	154

PART TWO

THE PARTE PRIMA OF THE CODEX VATICANUS
URBINAS 1270

Introduction.....	159
Physical Features of the Manuscript	159
History of the Compilation	160
The Manuscript Source of the <i>Parte Prima</i>	162
The Role of the Compilers of the Codex Urbinas	163
Editorial Procedures.....	166
Table of Contents to the <i>Parte Prima</i>	171
Italian Text.....	176
Translation	177
Commentary Notes	289
Section 1. Definitions of Painting, Chapter 1–12.....	289
Section 2. Comparisons of Painting and Poetry, Chapters 13–28	315
Section 3. Comparisons of Painting and Music, Chapters 29–32	361
Section 4. Comparisons of Painting and the Mechanical Arts, Chapters 33–34	373
Section 5. Comparisons of Painting and Sculpture, Chapters 35–45, and Chapter 46 on Poetry	383
Appendix 1. “Trattato Sequences” in Leonardo's Writings.....	414
Appendix 2. Guide to Related Passages in the Original Manuscripts	424
Consolidated Bibliography.....	428
Photographic Acknowledgments	452
Index	453

ACKNOWLEDGMENTS AND PREFACE

This study was completed with the generosity of several grant-awarding institutions. Early research was supported by Wellesley College, the Virginia Museum of Fine Arts, and the University of Virginia. The Institute for Research in the Humanities at the University of Wisconsin-Madison, and a postdoctoral fellowship at the Folger Shakespeare Library, Washington, D.C., made it possible to begin revising that manuscript in stimulating, collegial environments. The University of Colorado at Boulder, my own institution, contributed research and travel funds that enabled me to prepare the manuscript for press, and the Committee on University Scholarly Publications helped to defray the costs of publication.

Portions of this study have been read in other forms as papers, at The Johns Hopkins Center for Italian Studies, Villa Spelman, Florence (1986); the Sixteenth Century Studies Conference (1988); and the College Art Association Conference (1989). My thanks go to those audiences, who clarified many issues for me. A somewhat condensed version of my essay, "Leonardo's Color and Chiaroscuro Reconsidered: The Visual Force of Painted Images," is reprinted with revisions from the *Art Bulletin* 73 (1991): 63–88, by permission of the College Art Association, Inc., as parts of Chapters One and Three, and Appendix 1.

Among the earlier generations of Leonardo scholarship whose contributions are noted throughout this study, I found Arturo Uccelli's ordering of the writings on mechanics (1940) unsurpassed as a model of methodology. I would also like to single out Irma Richter, whose earlier edition of the *Paragone* (1939 and 1949) provides a knowledgeable overview of the arguments that made Renaissance rivalries of painting and sculpture famous. The scholar whose immense contribution to our understanding of Leonardo's writings is most apparent throughout this book is Professor Carlo Pedretti. A modern critical edition of the *Paragone* could not have been conceived before the recent ordering of Leonardo's notes by Professor Pedretti, and it is hoped that soon the entire *Codex Urbinas 1270* will benefit from the solid foundation of scholarship that he and other contemporary Leonardo specialists have been providing for the past several decades.

For his professional encouragement to many young scholars including myself, and for his unparalleled contribution to Leonardo

studies, Martin J. Kemp deserves a very special accolade. As a reader for Brill Publications who long ago revealed his anonymity, Professor Kemp made a series of useful suggestions that I have tried to incorporate.

At the dissertation stage, at the University of Virginia, my advisor David Summers provided an inspiring example of scholarship. Without his intellectual guidance, I would never have attempted to construct the textual context for Leonardo's ideas that is the foundation of my study. The shortcomings of my approach to Leonardo's writings, needless to say, are my own responsibility.

Over the years teachers, friends, and colleagues have helped at various stages of revision. I would here like to thank those who read parts of the manuscript: Paul Barolsky, Janis Bell, Aline Brandauer, Anthony Cutler, Erika Doss, Gail Geiger, Lawrence Goedde, David Lindberg, Robert Pois, Alex Sweetman, Brian Vickers, Carroll William Westfall, Robert Zwijnenberg, and especially Pamela Jones and Mary Pardo, who renewed my perspective on the material at crucial points. Although I am responsible for the mistakes that may remain, several individuals deserve recognition for their special collaboration. Dr. Armando Petrucci, Professor of Paleography at the University of Rome, provided greatly needed direction at the beginning of my labors. Dr. Gian Carlo Garfagnini, of the Istituto Nazionale di Studi sul Rinascimento in Florence, checked my transcription of the *Parte Prima* of the *Codex Urbinas* and offered valuable advice on how to present the text. Donatella Baggio-Bettini helped me revise the translation, which benefited substantially from her sensitivity to Leonardo's Tuscan expressions. Dr. Paolo Galluzzi, Director of the Museo di Storia della Scienza in Florence, and Professor Augusto Marinoni facilitated access to Leonardo's original manuscripts. I am also indebted to curators and librarians at the institutions in which I examined the manuscripts: the Biblioteca Ambrosiana, Milan; the Biblioteca Nacional, Madrid; L'Institut de France, Paris; the Victoria and Albert Museum and the British Museum, London; the Royal Library at Windsor; and the Vatican Library. I also appreciate the assistance of Joyce Ludmer and her staff at the Elmer Belt Library of Vinciana at the University of California, Los Angeles.

To my editor Nancy Mann at the University of Colorado, I am indebted for many insights about the organization and presentation of the material. Ann Underwood and Carol Sheppard typed ongoing drafts, demonstrating remarkable talents in graphology: I thank them for their efficiency and patience. Students who listened to parts of the study that surfaced in the classroom explored many

ideas with me. I am especially pleased to acknowledge the members of my graduate seminar on the relationship between Leonardo's *Paragone* and his studio practices. Even though many of their most interesting findings lie beyond the immediate confines of this book, the seminar put my approach to a rigorous test and consequently improved the final text. Ongoing discussions with Jennifer Rashleigh, who just completed her master's thesis on the invention of the *Last Supper*, have enriched my understanding of the synthetic practice that Leonardo forged from rhetorical and scientific theory. I am also immeasurably indebted to Jennifer for helping me verify the notes and bibliography, a labor that could not have been completed without the generous cooperation of the Interlibrary Loan Department of the University. In particular, I thank Regina Ahram for her resourceful handling of my requests. In Leiden, Elisabeth Erdman-Visser and Pim Rietbroek engineered the production of a complicated book. I would also like to express my warm thanks to Professor Arjo Vanderjagt for the privilege of contributing to his series of innovative approaches to intellectual history.

Other friends and family members supported this study in ways they know best: Marjorie Balge and Dick Crozier, Ann Chenoweth and Alan Sader, my parents John and Kathleen Farago, my brother and sister-in-law Peter and Lucretia Farago, Marina de Fazio and Stephen Kellogg, Loretta Freiling, Dave Grusin and Nan Newton, Werner Gundersheimer, David Jordan, John Keber, Jerry Kunkel, Mary Alice Lee, Sally Mansfield, Tadeus Maslowski, Hans Posthumus Meyjes, Joanne and Arnold Paradise, Joyce Robinson, William Shoup and Judith Thomas, Gunnar Sorelius, and Sylvia Strawn. Old friends at the Virginia Museum in Richmond encouraged me to begin this project and new friends at the University of Colorado enabled me to bring it to a timely conclusion. I owe most of all to the understanding and good humor of my husband Ken Iwamasa.

Finally, I want to acknowledge the existing need for studies that draw connections between Leonardo's literary comparisons of the arts and the visual evidence. Many topics that bridge this gap deserve attention. My work here has focused on the text. By examining the relationship of the *Codex Urbinas* passages to holograph writings, I aim to provide a solid foundation for many new interpretations of the visual material, not only Leonardo's but also the paintings, sculptures, and graphic art of his artistic successors. Methodological considerations, above all the open-ended nature of relating discourse to concrete images, which seemed to present

unwieldy problems in a critical edition, encouraged me to focus the commentary on text-to-text relationships that I could determine more precisely. Of course, the reader who traces Leonardo's arguments to his manuscripts will find text and image juxtaposed in many places, often so that direct relationships to commissions and independent drawings can be established.

New studies of Leonardo's studio practices that take developmental aspects of his writings into account are urgently needed. Perhaps this is most apparent with regard to the evidence assembled in Chapter Three, where it is argued that our modern vocabulary mitigates the central role played by *colore* in Leonardo's "tonal composition." Leonardo's long term interest in color calls for revisions in the prevailing view that he was principally interested in light and shadow. In a classic essay now thirty years old, John Shearman first urged this revision when he argued on the basis of formal analysis alone that Leonardo's paintings manifest an increasingly complex tonal structure and progressively lighter palette.¹ The ongoing conservation of the *Last Supper* has extended Shearman's claims for Leonardo's late colorism by at least a decade, to a period within three years of extensive discussions of reflected color recorded in *Ms. A*.

Perhaps one day even the murky green varnish of the *Mona Lisa* will be lifted and we will see her smile under a sunnier sky. Yet there are other reasons for the tenacious view that Leonardo fabricated dark paintings. Leonardo defined pictorial composition on the optical principles governing the contrast of different intensities of reflected colored light. Among his most important immediate sources is Alberti's discussion of how painting consists of alternating light and dark values.² Neither Leonardo nor Alberti ever systematically elaborated associations between painted color, apparent color, and musical harmony. In the mid-sixteenth century, however, artists like Paolo Veronese and Federico Barocci combined the physical science of optics that deals with apparent color and (perhaps only indirectly) theories of musical harmony. In this period, many writers including Vasari, Lomazzo, Paolo Pino, Ludovico Dolce, and Daniele Barbaro first described the harmony

¹ Shearman, "Leonardo's Colour and Chiaroscuro."

² Alberti, *On Painting* 2.46.

³ For sixteenth-century texts on color, see Thornton, "Renaissance Color Theory," 223 ff.; and discussion in Hall, ed., *Color and Technique in Renaissance Painting*, especially the essays by Charles Parkhurst and David Summers. The forthcoming study of Paolo Pino by Mary Pardo will consider the relationship between theory and practice in Venetian painting.

of painted color in musical terms.³ Although Leonardo had compared painting to music, praising the painter for his ability to present harmony in a simultaneous visual configuration, he treated painted color solely in terms of the science of optics, maintaining that all colors are equally dark without light. His successors like Veronese, however, who combined their knowledge of optics with musical theory, effected a synthesis that provided an infinitely greater range of palette.⁴

As Kathleen Weil-Garris Brandt reminds us, sixteenth-century writers like Vasari and Lomazzo thought that Leonardo's "dark manner" enabled him to create sculptural *rilievo* that does "everything that nature herself can do."⁵ But our current view that sixteenth-century painters handled pictorial color while Leonardo nearly banished color from his art, needs to be revised in light of the historical circumstances that wedded optics to musical theory.⁶ Leonardo's extensive writings on *chiaro e scuro* and other writings in the same tradition of natural science have important consequences awaiting further study. Recent scholarship on the followers of Correggio, the Carracci family, and Federico Barocci has laid the groundwork for future interpretations that bring the history of theory to bear on the visual evidence.

As I worked on the issues presented by Leonardo's arguments in defense of painting, several attendant studies vied for attention. There is also the possibility of using Leonardo's arguments as an anchor in current debates over the nature of representation, as I will suggest at the beginning of the first chapter. I hope that these and other worthy topics will recommend themselves to readers of this study.

Claire Farago
Boulder, Colorado
October 1990

⁴ This issue has been stated by Martin Kemp, *Science of Art*, 264 ff., a study long overdue that unfortunately appeared after this book went to press, as did several other exemplary studies concerning optics, listed in the Consolidated Bibliography: A.I. Sabra's commentary and translation of the first three books of Alhazen's *Optics*, Klaus Bergoldt's edition of Ghiberti's *Commentarii*, and a study of Renaissance centralpoint perspective by G. Janowitz.

⁵ Brandt, *Leonardo and Central Italian Art*, 13, citing Lomazzo, *Idea del tempio della pittura* (1590), 51. Vasari pointed out that Leonardo's *oscurità* provided the basis for modern artists like Raphael to give painting the *rilievo* to rival sculpture (Vasari, *Vite*, ed. Bettarini-Barrochi 1:185; discussed by Brandt, 12). On the history of this language, see Freedman, "'Rilievo' as an Artistic Term."

⁶ On the consensus view, see Chapter Three, n. 15. The issues are more extensive than the present study can encompass, but see my forthcoming article, "On Leonardo da Vinci's Defense of Painting against Poetry and Music, and the Grounding of Aesthetic Experience," *Italian Culture* (1991).

LIST OF ILLUSTRATIONS

1.	Attributed to Tullio Lombardo. <i>Pietà</i> . Overview and detail. Late 1520s. Marble. Rovigo, Duomo.	12
2.	Giovanni da Bologna. <i>Rape of the Sabine Woman</i> . Before 1583. Marble. Florence, Loggia dei Lanzi.	22
3.	Attributed to Jan Miel. <i>A blind man comparing painting and sculpture</i> . Turin, Galleria Sabauda.	23
4.	Attributed to Leonardo da Vinci. <i>Portrait of a Lady with an Ermine (Cecilia Galleriani)</i> . c. 1485. Cracow, Czartoryski Museum.	46
5.	Antonio Pollaiuolo. <i>Battle of Nude Men</i> . Engraving. 1470s. London, British Museum.	52
6.	Leonardo da Vinci. Battle of horsemen and foot soldiers. Preparatory study for <i>The Battle of Anghiari</i> . c. 1504. Pen and ink. Venice, Accademia.	53
7.	Bertoldo di Giovanni. <i>Battle Relief</i> . Before 1491. Bronze. Florence, Museo Nazionale del Bargello.	54
8.	Michelangelo. <i>Battle of Centaurs and Lapiths</i> . c. 1492. Marble. Florence, Casa Buonarroti.	55
9.	Studiolo of Federico da Montefeltro. 1470s. Intarsia. Urbino, Palazzo Ducale.	58
10.	Sandro Botticelli. <i>The Calumny of Apelles</i> . 1497–1498(?). Panel. Florence, Uffizi.	70
11.	Leonardo da Vinci. Two Views of the Skull. c. 1489. Pen and ink over black chalk. Windsor, Royal Library, W19057.	74
12.	Leonardo da Vinci. Studies for the lantern tower of Milan Cathedral. <i>Codex Trivulzianus</i> , folio 8 recto. c. 1488–1490. Milan, Castello Sforzesco.	84
13.	Leonardo da Vinci. <i>Ms. A</i> , folio 113 verso (now known as <i>Ashburnham 2038</i> , folio 32 verso). Paris, L'Institut de France, MS 2185.	102
14.	Filippino Lippi. Carafa chapel, entrance. 1489–1492. Fresco. Rome, Sta. Maria Sopra Minerva.	124
15.	Leonardo da Vinci. Study for <i>The Virgin and Child with St. Anne</i> . Black chalk. c. 1508–1510. Paris, Louvre.	140
16.	'First' design for Michelangelo's Catafalque in San Lorenzo. 1564. Pen and ink with wash. <i>Codex Resta</i> . Milan, Biblioteca Ambrosiana.	142

- | | | |
|-----|--|-----|
| 17. | Martino Bassi. Bassi's own design for the Annunciation relief, Milan Cathedral. From <i>Disparei in materia d'architettura et prospettiva</i> , Florence, 1572. | 150 |
| 18. | Martino Bassi. Analysis of the perspective construction in Pellegrino Tibaldi's Annunciation relief for Milan Cathedral. From <i>Disparei in materia d'architettura et prospettiva</i> , Florence, 1572. | 151 |
| 19. | Text figure. <i>Codex Vaticanus Urbinas 1270</i> , folio 2 recto. Detail. The Vatican Library. | 182 |
| 20. | Leonardo da Vinci. Storm breaking over a valley. c. 1500. Red chalk. Windsor, Royal Library, W12409. | 288 |
| 21. | Leonardo da Vinci. Studies of horses, lions, and dragons. Pen and ink. c. 1515. Windsor, Royal Library, W12331. | 316 |
| 22. | Leonardo da Vinci. A sheet of picture-writing including musical notes. c. 1487–1490. Pen and ink. Windsor, Royal Library, W12699. | 360 |
| 23. | Leonardo da Vinci. Volute gear for a barrel spring. <i>Madrid Codex I</i> , folio 45 recto. c. 1498–1500. Pen and ink. Madrid, Biblioteca Nacional. | 374 |
| 24. | Leonardo da Vinci. Study of Michelangelo's <i>David</i> . c. 1504. Pen and ink. Windsor, Royal Library, W12591 recto. | 380 |

ABBREVIATIONS

AB	<i>The Art Bulletin</i>
DHI	<i>Dictionary of the History of Ideas</i> . Ed. Philip Wiener. 5 vols. New York, 1973.
JHI	<i>Journal of the History of Ideas</i>
JWCI	<i>Journal of the Warburg and Courtauld Institutes</i>
Scritti	<i>Scritti d'arte del cinquecento</i> . Ed. Paola Barocchi. 9 vols. Turin, 1977.
Trattati	<i>Trattati d'arte del cinquecento</i> . Ed. Paola Barocchi. 3 vols. Bari, 1961.

References to Leonardo's manuscripts follow standard forms of abbreviation:

- CA = *Codex Atlanticus* (I follow the folio numbers of *Il Codex Atlanticus di Leonardo da Vinci nella Biblioteca Ambrosiana di Milano*, Reale Accademia dei Lincei, transcribed by G. Piumati, 35 vols., Milan, 1894–1904, in order to permit concordance with the existing anthologies and literature; the current critical edition edited by A. Marinoni has been consulted).
- R.1 = Richter, J.P., *The Literary Works of Leonardo da Vinci*, 2 vols., 2d rev. ed., London, 1939, passage number 1.

All references to the last 24 folios of *Ms. A*, which have been bound separately as *Ashburnham II*, are cited as *Ms. A*, following the recent edition by A. Corbeau and N. De Toni (full bibliographical information to this and other facsimiles of Leonardo's writings is cited in the Consolidated Bibliography).

CN = Commentary Notes numbered 1 through 46, accompanying the passages in the *Parte Prima* of the *Codex Urbinas*.

Chapters One through Four = introductory chapters of the present study.

Chapters 1 through 46 = numbered passages of the *Parte Prima*.

PART ONE

CRITICAL INTERPRETATION

CHAPTER ONE

THE PARAGONE

Leonardo da Vinci argued for the supremacy of painting over the arts of poetry, music, and sculpture in writings that are known today as his *Paragone*, the first important contribution to the Renaissance debates on the preeminence of the visual arts.¹ The texts known as the *Paragone* form the opening section or “book” of the *Codex Vaticanus Urbinas Latinus 1270*, which is called in the original manuscript the *Parte Prima* of the *Libro di Pittura di M. Lionardo da Vinci*. Of the forty-six passages or “chapters” compiled in the *Parte Prima*, the majority are known only in this unique manuscript, the most complete version Leonardo’s so-called *Trattato*, his treatise on painting.² From the internal evidence, we know that the *Codex Urbinas* was compiled around the middle years of the sixteenth

¹ Three decades ago and more, Julius von Schlosser, Rensselaer Lee, and Jean Hagstrum in large measure established the reputation of Leonardo’s *Paragone* but their studies considered Leonardo’s writings only in passing. For an introduction to the “Paragone” disputes, see I. Richter, *Paragone*, still the most comprehensive study of the Renaissance literary debates on painting and sculpture. Most recently, see Mendelsohn, *Paragoni*; and S. Rossi, *Dalle botteghe alle accademie*. The most comprehensive introduction to Renaissance art theory is von Schlosser, *La letteratura artistica* (p. 176 for reference to “Paragone questions,” including Leonardo’s). Other overviews of Renaissance art theory are Blunt, *Artistic Theory in Italy*, and Barasch, *Theories of Art*.

² See the introduction to the *Parte Prima* texts and further, on the history of the manuscripts, see J.P. Richter, *The Literary Works of Leonardo da Vinci*, 2: Appendix; Marioni, “I Manoscritti di Leonardo da Vinci”; Steinitz, *Leonardo da Vinci’s Trattato*, 37–138; Pedretti, *Commentary*, 1: 12–47, 20 for a conjectural reconstruction of the sequence of manuscript copies; 2: 395 ff., where he amplifies Richter’s history of Leonardo’s manuscripts. According to this reconstruction, an unknown prototype of the abridged version intervened between the *Codex Urbinas* and all later copies. When the first edition of Leonardo’s manuscript on painting (i.e., the anthology compiled under Melzi’s direction) appeared, in an abridged version, it bore the title *Trattato della Pittura di Leonardo da Vinci* (ed. Raffaele du Fresne, Paris, 1651). Perhaps the title “Trattato” originates in a manuscript tradition. The earliest manuscript with a similar title seems to be *Ms. H227 inf.* in the Ambrosiana Library, Milan, composed of several manuscripts compiled between 1634 and 1640 and owned by Cassiano dal Pozzo, who wrote the title page, which begins “Trattati di Pittura di Leonardo da Vinci” (see Steinitz, *Leonardo da Vinci’s Trattato*, 99, group D, n. 1). *MS H229 inf.* (Steinitz, 105, group D, n. 2), with the title on fol. 20r, also written in the hand of Cassiano, begins “Trattati e parti di trattati diversi di prospettiva. . . .” The 1651 Paris edition, which originated with Cassiano’s plans to publish Leonardo’s treatise, is based on a copy of the abridged treatise illustrated by Poussin (*MH 228 inf.*), most likely a copy similar to *Codex Barberini 4304* (entitled “Opinione di Lionardo da Vinci . . .”), although it is not

century from eighteen of Leonardo's notebooks, over half of which are now lost.³ Four passages in the *Parte Prima* are still extant in Leonardo's hand, in *Ms. A*, while additional drafts and other directly related passages occur scattered among the 6,500 pages of Leonardo's surviving notes.⁴

The modernity of Leonardo's observations on the nature of painting has astounded many twentieth-century readers. It is not surprising that the *Paragone* is often cited as a key document in the history of critical questions currently under discussion.⁵ His richly conceived arguments address issues that have been relevant from the time that Plato discussed imitation until now when the inter-relationship of word and image is a subject of investigation that cuts across many fields. Later literature on the comparison of the arts, like Gotthold Ephraim Lessing's 1766 essay *Laokoon*, long considered to be the last definitive contribution to the *Paragone*, repeats many of Leonardo's arguments preserved today only in the *Parte Prima* of the *Codex Urbinas*.⁶ The *Codex Urbinas*, however, was evidently lost until the turn of the nineteenth century, and no systematic attempt has ever been made to distinguish Leonardo's "Paragone" from the independent life of the ideas he expressed. If

known for certain which manuscript was used by the printer (see Steinitz, 46–49, group B, n. 1). The sources of the *editio princeps* are discussed most fully by Pedretti, *Libro A*, 241–243, see especially p. 242, n. 9; and Steinitz, "Trattato Studies II," 233–254, p. 243, suggesting that *Ms. 11706* in the Hermitage Museum, Leningrad, served as the printer's copy.

³ According to Pedretti, *Libro A*, 123 ff., it is possible that Leonardo contributed to its organization. Internal evidence concerning the composition of the *Parte Prima*, however, argues against any direct collaboration by Leonardo, as discussed in detail in the introduction to the text and translation.

⁴ The most recent comprehensive attempt to deal with this vast material is Veltman, *Studies in Leonardo da Vinci I*, who cites this figure (p. 10). Veltman, p. 12, estimates 100,000 drawings. Pedretti, *Libro A*, 121–128, and *Commentary* 1: 76–85, has already collected the fragments and most direct secondary testimonies related to Leonardo's comparisons of the arts (see Appendix 2). See also Brizio, "Il Trattato della Pittura," 309–320; and in the present study, the guides to related passages in *appendice*.

⁵ Recently the history of the comparisons of the arts has been a subject of renewed interest; convenient bibliographies are found in *Articulate Images*, ed. Wendorf, and Mitchell, *Iconology*. Citations to Leonardo's *Paragone* occur too widely in the literature to document comprehensively, but a sampling includes Gordon, "Poet and Architect," 166; Mitchell, *Iconology*, 47; Hagstrum, *The Sister Arts*, 66–68; Blunt, "An Echo of the 'Paragone'," 261; Silver, "Step-Sister of the Muses," 39.

⁶ On Lessing, see Howard, Introduction, *Lessing's Laokoon*; Schweizer, *The Ut pictura poesis controversy*; Gombrich, "The Diversity of the Arts"; Wellbery, *Lessing's Laocoon*; McClain, "Time in the Visual Arts"; Cheetham, "Review of Wellbery, *Lessing's Laocoon*"; Rudowski, "Lessing contra Wincklemann"; and Silver, "Step-Sister of the Muses" (with an extensive bibliography). McGrath, "The Painted Decorations of Rubens' House," sets out the literary tradition of Apelles as an important theme in visual iconography of the *ut pictura poesis* tradition.

Leonardo's contribution to later discussions were better understood, we would have a more complete picture, but the real challenge lies elsewhere, with broader historical issues concerning the nature of representation.

Recently, a number of art historians have taken exception to the history of art as a "history of vision" because this notion is itself historical, and the assumption that the work of art is a model of perception, or its corollary that visual images are some kind of "language," is conventional and culturally specific.⁷ More precisely, it has been claimed that the history of art as a history of vision had its beginnings at the same time as optical naturalism, with artistic practices inaugurated during the Renaissance. The practice of art history as a discipline, beginning in the late nineteenth century, "naturalized" the Renaissance metaphor so that even today optical painting is widely understood as a "natural" sign compatible with our actual visual experience of the world.

What was the situation when art first came to be defined as a model of perception, three centuries before painting, sculpture, and architecture were designated under the unifying category of the "visual"? Modern critiques of formalism which address the interrelationship of word and image, broadly speaking, can be significantly illuminated by Renaissance comparisons of the arts, and particularly by Leonardo's *Paragone*. Leonardo's contention that the "universal language" of painting is based on the geometric science of perspective is one of the first of many such arguments, which have remained at the center of debates on the nature of representation until our own time. In the mid-sixteenth century Vasari wrote about three "arti del disegno," but the crucial category "visual arts" apparently originates much later, in the late eighteenth and nineteenth centuries.⁸ Numerous critics have charged that autonomous histories of the "visual arts" are grounded in formalist and "essentialist" perceptual categories

⁷ Among the many significant critiques of the foundationalist assumptions of the discipline that have appeared in the last few years are contributions by Norman Bryson, *Vision in Painting*; Rosalind Krauss, "The Story of the Eye"; David Summers, "The 'Visual Arts' and the Problem of Art Historical Description"; and now, the most sustained and provocative attack to date, Donald Preziosi, *Rethinking Art History*.

⁸ See following discussion on the origins of "Paragone." The classic study of the nomenclature we still use to classify the individual arts is Kristeller, "The Modern System of the Arts," but neither this study nor related investigations that have addressed the origins of the term "Renaissance" have been aware of the relatively recent origins of the term "visual arts." (The history of scholarship is summarized by Panofsky, *Renaissance and Renascences*, Chapter 1; and see his critique of Kristeller's essay, in *Galileo*, 2, n. 3.)

associated with German speculative idealism.⁹ However, no one has systematically studied the history of these categories. And as long as we project anachronistic categories upon the historical evidence by using terms like “visual arts” and “paragone” without critical awareness of their own historical origins, or impose arbitrary disciplinary boundaries upon the material, both the historical issues and current problems will be severely distorted.

One thread surfacing intermittently throughout the present study concerns significant correspondences between humanist theories of rhetorical invention and Leonardo’s defense of painting as a language. The question is, why have these correspondences previously been overlooked? Our inherited categories of thought, according to which the “visual arts” have always existed as pure objects of perception and aesthetic contemplation, must be partly to blame for this omission. Primary literary sources make it clear that the term “arte” was conceived quite differently in Leonardo’s time from the way it is today. As the status of painting and sculpture rose, their procedures were increasingly associated with other “arts,” such as the “artes disserendi.” “Art” signified procedures, and it was the equivalent of terms such as “method” or “compendium.” Indeed, debates concerning method are the *locus classicus* for discussions of “arte” during the sixteenth century.

As early as 1951, Paul Kristeller argued that the systematization of the fine arts at the beginning of the eighteenth century received impetus from seventeenth-century models of scientific truth.¹⁰ But these connections and their Renaissance precedents have yet to receive the attention they deserve. Moreover, modern scholarship dealing with the history of the comparison of the arts, like Jean Hagstrum’s classic study of pictorialism in English Romantic poetry, has helped focus modern interpretations of the entire *ut pictura poesis* tradition on late eighteenth-century themes like the unity of the visual arts.¹¹ It is often assumed that the initiating argument for formalism is expressed in Kant’s remarks on the beautiful, and indebted to his immediate predecessors like Alexander Baumgarten or Lessing who were also focusing on the general conceptions and

⁹ See especially Summers, “‘Form,’ Nineteenth-Century Metaphysics, and the Problem of Art Historical Description”; Holly, *Panofsky and the Foundations of Art History*; Hart, “Some Reflections on Wölfflin” and “Reinterpreting Wölfflin.”

¹⁰ Kristeller, “Modern System of the Arts.” Kristeller, Part One, 516, credits Leonardo’s *paragone* with being the “most complete system of the fine arts” from the Renaissance period.

¹¹ Hagstrum, *The Sister Arts*, with a very useful synopsis of ancient literary precedents (Chapter One).

principles of the arts.¹² Actually the issues have a much deeper history: what began as polemical arguments about the relative merits of painting and sculpture by the later eighteenth century had attained a new level of philosophical credibility. Lessing and Kant, who for all their differences were both strongly suspicious of excessive pictorial ornament (which Kant associated with the imagination unguided by reason), imparted their biases to their nineteenth-century successors. Hegel, Schnaase, Riegl, Wölfflin, and others who proposed the first autonomous histories of the “visual arts,” expanded Kant’s hierarchical distinction between rational and irrational representations (and the accompanying distinction between disinterested delight in pure “form” and the desire or appetite for the sensible or “empirical” object).¹³ In ways that are even now imperfectly understood, like Leonardo and many other Renaissance writers, they also privileged two-dimensional images over three-dimensional ones.

A now discredited assumption about the unity of the arts has also tended to impose on modern critical issues. Perhaps the rivalries have never been resolved, but merely occasioned temporary victories. Recently it has been suggested that Lessing’s famous distinction on the limits of pictorial expression in his *Laokoon*, should be read as a German reaction against the excessive pictorialism of French and English poets; elsewhere, in David’s studio, the rivalry of painting and sculpture was a live issue in the nineteenth century.¹⁴ Have theories of representation always tended to privilege one art form above another? Where does that leave our current distinctions, especially in the crucial area concerning the differences between discourse and image? The interart analogies examined in the present study deserve attention in this connection. The presentation does not construe Leonardo’s invectives as the exclusive source of later debates; rather, the evidence indicates that many of his arguments are conventional (borrowed from literary as well as scientific sources), while others were fabricated by his original sixteenth-century editor out of diverse fragments.

¹² See Simpson, Introduction to *German aesthetic and literary criticism*.

¹³ For an overview of nineteenth-century theories of art, see Podro, *The Manifold in Perception*, and *Critical Historians of Art*.

¹⁴ On Lessing’s polemical stance, see Schweizer, *The ut pictura poesis controversy*; I owe the information concerning David’s studio to a conversation with Dorothy Johnson, who is currently writing a study of the issues for publication. Her research on David is most recently available as “Corporality and Communication.” See also, Roy Park, “*Ut Pictura Poesis*: The Nineteenth Century Aftermath.” On the relevance of issues associated with the “paragone” of line and color to the flat linear style associated with neoclassicism, see Rosenblum, “The Origin of Painting.”

Moreover, many writers who had access to the same basic sources evolved similar ideas. Leonardo's language, however, often refers equivocally to the precedent history of ideas and admits of multiple interpretations, an aspect of his argumentation that has demanded diverse methodological strategies. The associations that he seems to have made, irreverent of intellectual conventions, also lack the conventional evidence by which direct sources can be ascertained. I have tried to follow a middle course between a historical determinism that would oversimplify the origins and subsequent influence of Leonardo's views, and a more refined analysis that would dissipate into myriads of subtle textual problems the very real artistic issues that are potentially most interesting to today's readers.

The Term Paragone

The literary term *Paragone* was not originally associated with the Renaissance writings which bear its name, but dates only from 1817 when Guglielmo Manzi published the *editio princeps* of the *Codex Urbinas*. By 1939, when the *Parte Prima* was published as the *Paragone* for the second time, by Irma Richter, scholars had extended the word's meaning not only to all of Leonardo's comparisons of the arts, but also to other sixteenth-century polemics on the status of painting and sculpture.¹⁵ Today, *Paragone* is used to refer universally to polemical writings on the comparison of the visual arts regardless of period.¹⁶

The Italian noun *paragone*, like the English word *paragon*, is thought to be compounded from the Greek preposition *para*, mean-

¹⁵ I. Richter, *Paragone*, v, notes that the title "Paragone" was first used in Manzi's edition of the treatise. Von Schlosser, in the first edition of his *La letteratura artistica*, published in 1924, refers to "Leonardo's Paragone" and other "Paragone questions" on the disputed supremacy of painting and sculpture (p. 176 of the 3rd revised edition). As an example of the more recent diffusion of this term, Lee, in the preface to the 1967 edition of his essay, "Ut pictura poesis," notes contributions to the "Paragone literature," whereas in the original 1940 version of the essay Lee had used the word "paragone" only in reference to Leonardo's arguments (in the 1967 edition, pp. vii and 56). Most recently, Mendelsohn's 1982 study of Varchi, who never used the term, is entitled *Paragoni*. Mendelsohn, *Paragoni*, 212, n. 1, discusses the modern etymology of *paragone* in a manner similar to the present discussion, but nonetheless retains it throughout her study. Pedretti, who has contributed most extensively among modern scholars to the study of Leonardo's writings comparing the arts, never questions the source of the term.

¹⁶ Lately, this modern critical term has been extended to classical scholarship. See, for example, Trimpi, "Horace's 'Ut pictura poesis,'" 45: "in Aristophanes' *paragone* of Aeschylus with Euripides in *The Frogs* (838-1533)." See also Cohen, "Paragone."

ing “beside”; and *agon*, meaning a contest, or any kind of struggle.¹⁷ There is, however, no ancient Greek word “paragone.” Modern philologists believe that *paragone* is related to the ancient Greek verb *parago*, which means to lead beside or to bring and set beside, or to mislead or distort. A Latin nominalized form probably served as an intermediary step between the modern substantive and the ancient Greek verb—something like the Latin *paragonizo* would account for this derivation. It is also possible that the Italian noun *paragone* is a corruption of the Greek *parakone* which first appears in medieval Greek. *Parakone* is compounded from *akone* meaning whetstone; in this case, there would be no etymological connection between *paragone* and *agon*. The medieval Latin verb *paragonizare* or *paragonisare*, which means “comparare, conferre” are also close relatives of the Italian forms.

Although the quarrel between painting and sculpture is widely mentioned in primary literary sources, it is doubtful that anyone living during the Renaissance referred to any literary form as a “paragone.”¹⁸ Leonardo himself could not have used the word in any semblance of its modern denotation. His use of the common verb form *paragonare* meaning “to compare” two relative qualities, is in line with the early contextual definition, given by Bernardo Segni in his 1550 commentary on Aristotle’s *Nicomachean Ethics*, according to which all things that make permutations in a certain manner are comparable (*paragonabile*).¹⁹ Leonardo wrote specifically about comparing (*paragonando*) the contrasting colors of black and white, and about the conjunction of opposite values seen on any lighted surface in relief.²⁰ His application is at least circumstantially interesting because the study of light and shadow, the science

¹⁷ The following discussion is based upon Liddell, Scott, Jones, and Mackenzie, *A Greek-English Lexicon* and Maigne d’Arnis, *Lexicon manuale*. I thank David R. Jordan and Stephen Kellogg for discussing the etymological history of the term with me.

¹⁸ “Paragone” defined as a comparison implies that the term might have originated in rhetoric. This definition is close to the ancient rhetorical figure *comparatio* or antithesis, but neither ancient texts like the *Rhetorica ad Herennium*, Cicero’s *De inventione*, or Quintilian’s *Institutio oratoria*, nor the medieval treatises listed by Faral, *Les arts poétiques*, include a figure called a “paragone.” Ancient and medieval precedents will be discussed further in Chapter Two.

¹⁹ Bernardo Segni, *Commentary to the Nicomachean Ethics*, Florence, 1550, Book 5 (as cited under “paragonabile,” in the *Vocabolario degli Accademici della Crusca*). The earliest comparative example cited in the *Vocabolario Crusca* is found in Petrarch, Sonnet 302 of the *canzoniere trionfi*. Battaglia, *Grande Dizionario*, gives the related expression “fare di paragone,” citing Guicciardini. The *Vocabolario della Crusca* gives other Renaissance equivalents to “paragonare” as “far paragona,” “assimigliare,” and “comparare.”

²⁰ The Latinate “equiparatione” and “comparazione” occur as titles of two passages in the *Parte Prima*, Chapters 41 and 42. For Leonardo’s usage, see *Ms. A*,

he called *chiaro e scuro*, is the fulcrum of his defense of painting.

But we do not know why Manzi coined the title *Paragone* for the *Parte Prima* of the *Codex Urbinas*. The word *paragonare* rarely occurs in Renaissance criticism before the late sixteenth century, and only in a handful of instances does it or derivatives occur in sixteenth-century writings on painting and sculpture.²¹ Of these, a few cases are worth mentioning. They are important precedents to modern usage, and perhaps the source of Manzi's coinage, but these cases also make it clear that *paragone* was not restricted to comparisons of the arts as it is today. Antonfrancesco Doni used the expression "dar paragone" in the dialogue *Disegno*, published in 1549, notably to compare the merits of painting and sculpture, but he also used *paragone* in the more generic sense of comparing any two relative qualities, "faccia a faccia," as he put it at one point of his dialogue.²²

In his biography of Michelangelo published in 1553, Ascanio Condivi used the expression "far paragone" in an anecdote describing how Michelangelo, in his youth, copied a drawing and treated the copy with smoke so that it was perfectly indistinguishable from the aged original.²³ Michelangelo himself, in an extended

fol. 4r, ca. 1490–1492; or *Ms. G*, fol. 12v, ca. 1510–1515: "When you portray any body remember when to make comparisons (*paragonando*) of the strength (*potentia*) of the lights of its illuminated parts, which often deceive the eye by appearing brighter than the bright part. The cause is due to the comparison of the parts that confine them. Because if you have two parts of unequal brightness and the less bright part confines with its dark part, and the brighter part confines with its bright parts, then the sky and things of similar brightnesses will be less bright, or to put it another way, the lucid will appear more lucid and the more lucid will appear darker."

²¹ On references to art, see the following note. Beginning in the late sixteenth century, as Chapter Four will elaborate, cognates of "paragone" were sometimes used with reference to *phantasms*, or the images existing in the imagination, as things comparable to optical illusions, poetic "similitudes," or even "discourses."

²² Citing Doni, *Disegno*, fol. 25r. This text is the exception to the rule in that cognates of "paragone" are sprinkled liberally throughout the dialogue. The first reference occurs on fol. 13v; more general uses of the word occur on fols. 21v, 30v, 33v, 35r, 35v, and in a letter dated 16 October 1549 addressed to Rocco Granza, included in the same volume (fol. 58v), where Doni argues that painter and poet enjoy a certain "libertà" that suggests another *paragone*, between a jeweller and a compositor of books, both of whom profit from things that come into their hands. An even more interesting discussion involving the word "paragone" occurs in the dialogue *Disegno* on fols. 40v–41r, where the interlocutors discuss whether painting is better as it approaches relief and sculpture worse as it approaches painting. "Il Cavaliere" remarks that the ancients, who have written enough about these disputes, could not have intended just to treat "paragoni et esempi."

²³ Condivi, *Vita di Michelagnolo Buonarroti*, fol. 4r: "Molti di cio volson far paragone, ne trovaron differenza, per cioche altre alla perfettione del ritratto, Michelagnolo col fumo lo fece parer di quella medesima vechiezza, ch'era esem-

epithet, praised Tommaso Cavalieri with this hyperbole: "[you are] without paragon in this world . . . having no match equal to yourself . . . it is much the same to wonder at God's working miracles as to marvel at Rome producing wonderful men."²⁴ Ludovico Dolce, in his 1557 dialogue on painting entitled *L'Aretino*, employed the expression "su'l paragone" in the course of an extended comparison between the visual and literary arts, but he did not use this expression to designate a comparison of the arts.²⁵ The general topic of his dialogue is the excellence of the artist and the criteria by which his art can be judged, which Dolce approached through the rivalry between the *maniere* of specific Venetian and Florentine artists. Modeled after ancient discussions of literary style—and foreshadowing modern usage—the conversation included a comparison of the diverse *maniere* of painters and historians, poets, and orators. Dolce's interlocutor in the dialogue "Francesco Fabrini" even claimed that this "paragone" was the reason for his discussion with "Pietro Aretino."²⁶

Possibly Dolce is the source of Manzi's coinage. Applied to individual painters and sculptors as epithets of praise and blame, comparisons of living artists with their exemplary precedents follow an ancient rhetorical pattern used to discuss individual virtues of style. The commonplace verb "paragonare" continued to appear in seventeenth-century writings in this context of an exemplum.²⁷

An early incidence of the cognate occurs in a letter written by the sculptor Tullio Lombardo in 1526 to his patron in Rovigo concerning a sculpted relief for a family chapel. Significantly, the way in

pio. Questo gli arrecò molta reputatione." ("Many wanted to compare the two, and they found no difference because, apart from the perfection of the copy, Michelangelo had used smoke to make it seem as old as the original. This gained him a considerable reputation." Cited from *The Life of Michelangelo*, 10). The cognate also occurs in Francesco Sangallo's 1547 letter to Varchi, reprinted in *Scritti*, 3: 514, comparing two sides of a statue (">1 paragone"); and Vincenzo Borghini, *Disputa circa il primato delle arti*, reprinted in *Scritti*, 2: 673, in a discussion of the classification of the arts written between 1563 and 1580.

²⁴ Letter to Cavalieri, January 1533, existing in several drafts, cited here from Symonds, *The Life of Michelangelo*, 2: 134–135.

²⁵ Roskill, *Dolce's L'Aretino*, 88: "'Aretino': 'Non vorrei venir su'l paragone per fuggir le comparationi lequali sono sempre odiose.'" A similar occurrence using the phrase "venir a paragone" occurs on p. 158.

²⁶ Roskill, *Dolce's L'Aretino*, 198.

²⁷ A typical example is the following comparison between Annibale Carracci and two ancient orators, Dionysius of Halicarnassus and Demetrius: "Ne massimamente, che l'istesso libro delle Figure, che à Voi vien dedicata, ne porge opportuna occasione da osservare, se Annibale Carracci si possa *paragonare* a Dionisia a Demetrio, & ed altori che gli oggetti imitavano . . ." (emphasis added; Giovanni Mosino [Massani], *Diverse Figure . . . da Annibale Carracci*, Rome, 1615, 15, cited in Mahon, *Seicento Art and Theory*, 258–259).



Ill. 1. Tullio Lombardo. *Pietà*. Detail. Late 1520s. Marble. Rovigo, Duomo.

which Tullio used the term brings to mind more extensive arguments made earlier by Leonardo and later by other writers. Tullio claimed that sculpture is superior to painting because it is more enduring: "la scoltura è molto più senza comparatione, et non da parrangonar con pittura per niun modo, perché de antiqui se ritrova sino alli nostri tempi de le sue scolture, con pittura veramente nulla si pol vedere."²⁸ And Tullio's completed sculpture in high relief, a *Pietà* with daring foreshortenings in the face and extremities of the Christ figure, immediately suggests the rivalry of painters and sculptors to achieve pictorial effects through the use of perspective (Figure 1). Leonardo, for one, defended the supremacy of low relief precisely on the grounds that it approached the difficulty of painting, with its various kinds of perspective.

The Italian noun *paragone* also means a test for the quality of gold and silver, or the lustrous black stone on which such a test is conducted—or, figuratively speaking, any test for excellence.²⁹ It is this figurative sense of *paragone* as a test or trial, more than just a comparison of relative qualities, that comes closest to the implications of the modern term.³⁰ Doni characterized the rivalry of painting and sculpture by alluding to a touchstone in the figurative sense of a test although without using the term *paragone*: his interlocutor "Natura" claims to have heard that sculpture was made of gold,

²⁸ (Sculpture is far more incomparable and cannot be compared with painting in any mode, because the sculptures of the ancients are rediscovered in our own times, but of [ancient] painting truly nothing can be seen.) Transcription cited from Puppi, "Per Tullio Lombardo," 103, "Documento I." Puppi, 103, compares this argument to one by Pomponius Gauricus, *De sculptura* (Florence, 1504; ed. Chastel and Klein, 255). Tullio's letter has been discussed most recently by Freedman, "'The Schiavona,'" 34, who postulates that Titian conceived a visual *paragone* influenced by Tullio's work.

²⁹ On the meaning of *paragone* as a test, see the following note. Giorgio Vasari, notably, used the noun form only to refer to a building material (see *Vasari on Technique*, 117), in a discussion of different kinds of stone used for ornamental details and sculpture. His use of cognate expressions is comparable to Dolce (see nn. 12 and 13), as cited by Mendelsohn, 212, n. 1) As late as Baldinucci's *Vocabolario toscano*, first published in 1681, "paragone" was defined only as a very hard stone that takes a beautiful lustre (118). Leonardo himself once labeled a sketch of a roughly football-shaped object, probably a stone, as a "paragone," but of course he did not use this sketch to refer to his comparisons of the arts. See Pedretti, *Comm.* to R. 681 (*Ms. H3*, fol. 100r): this sketch for a motto or emblem on the theme of truth is accompanied by the words "al paragone."

³⁰ The *Vocabolario della Crusca* (1623) suggests an etymology no longer accepted by philologists but of historical interest: that the Italian *paragone* by which one proves (*cimentare*) the quality of gold and silver, derives from the Greek stem *peira* meaning a trial or attempt (modern philologists accept the Greek stem *para*: see n. 13). The Crusca editors cite the Latin equivalent *experimentum*, meaning proof or test; this interpretation is clever because it provides the specialized modern (or possibly medieval) meaning of the noun *paragone* as a touchstone with an Ancient Greek etymology.

painting of silver, with the “upper right hand part” given to sculpture—a phrase that immediately brings to mind the allegorical statues planned for Michelangelo’s funeral, another famous episode in the rivalry of the arts.³¹ By 1598, when John Florio published the first edition of his English-Italian dictionary, the Italian noun *paragone*, although it did not designate a battle of the arts, could be “a match, an equall, a prooffe, a triall, an experience, an equality, a comparison. Also a conferring together, a touchstone to trie gold or good from bad. Also a like as good as one brings.”³²

The checkered history of the term befits the genre. During the Renaissance, literary polemics on the relative status of painting and sculpture emerged from a variety of sources that will be examined in the next chapter. The evidence of those sources strongly suggests that key critical issues now associated with the term, such as the value of evident artifice, did not emerge from the time-honored *ut pictura poesis* tradition alone, but were in part evoked by conflicts over the proper classification of knowledge that are already evident in Leonardo’s arguments. Furthermore, comparisons of the arts, and artists, occurred in various kinds of literary productions. Many of the passages included in Leonardo’s text are not even comparisons of the arts, strictly speaking, but rather concern the definition of painting or the comparison of the senses. Nor do Renaissance writers refer to comparisons of the arts as a general category, the way we do today; most of the writings associated with the rivalry of painting and sculpture in the sixteenth century address rather the nobility, sovereignty, or perfection of the arts.

The Manuscript Sources

We know little about the circumstances that first occasioned Leonardo’s defense of painting against the other arts. Puteolano’s dedication letter to Duke Lodovico Sforza in Simonetta’s *De gestis Francisci Sfortiae*, translated into Italian by Cristoforo Landino and published in Milan in 1490, has been proposed as such an occasion.³³ This dedication, appropriately enough, praised words

³¹ Doni, *Disegno*, fol. 94. Doni’s judgment specifically recalls Cellini’s argument associated with the program for Michelangelo’s catafalque. Michaelangelo’s funeral and attendant disputes are discussed most fully by R. and M. Wittkower, *The Divine Michelangelo*.

³² Florio, *A Worlde of Wordes*, 275. According to Finkenstaedt, Leisi, and Wolff, *A Chronological English Dictionary*, 472, the English noun “paragon” first occurred in 1548 and is derived from Old French.

³³ Dionisotii, “Leonardo uomo di lettere,” 209 ff., draws connections between Puteolano’s letter in Landino’s edition, Leonardo’s project for the equestrian monument of Francesco Sforza, and his insecure position at Court around

above images, above all other forms of memorialization, in a typically classicizing formula that recalls Cicero and brings to mind many other fifteenth-century examples such as Alberti's dedication of his treatise on painting. There is no documentation that Leonardo knew Landino's translation, but it is highly plausible that he did—as he might have also known other literary works in the same eulogizing vein, though perhaps none coincide so conveniently with the period when we know Leonardo composed invectives at the Sforza Court. Such an occasion would corroborate the testimony of Gian Paolo Lomazzo, claiming a century later that Leonardo wrote a book on the comparison between painting and sculpture at the request of his patron Duke Lodovico Sforza in Milan; but this book is lost.³⁴

The earliest *Paragone* arguments to survive date from *Ms. A*, composed around 1492, when Leonardo had been at the Sforza Court for about a decade. Although we do not know the date of his last writings on the subject, it seems likely that he was interested in the rivalry of the arts at least as late as 1508 to 1510, when he composed (or copied older passages into) the lost manuscript known as *Libro A*.³⁵ Echoes of these polemics recur in his manuscripts as late 1513.³⁶ Dating of passages in *Parte Prima* can often be established from a close reading of the text, when the language refers to specific issues Leonardo was investigating in related scientific researches. This evidence suggests that most of the polemics against poetry, music, and sculpture were conceived during his stay at the Sforza Court, largely by 1492, when he wrote

1489–1490, shortly before he resumed work on the horse on April 23, 1490. In a discussion of Leonardo's polemics, Marinoni, *La Matematica di Leonardo*, 40, adds that at this moment Leonardo was actively trying to approach the learned methods of *litterati*, as can be glimpsed from pages of the *Codex Trivulzianus* that contain Latin vocabulary taken from Roberto Valturio's *De re militari*. The connection between Landino's translation of the letter and Leonardo's polemics against poetry is repeated as a more definitive interpretation by Finger, *Catalogue of the Incunabula in the Elmer Belt Library*, 68, and Ponte, *Leonardo prosatore*, 49. It should be noted, however, that there are problems with this thesis: Leonardo's arguments in *Ms. A* are datable 1492—after he resumed work on the equestrian monument—and, furthermore, Leonardo identified himself as a sculptor in only one argument, *Parte Prima* Chapter 38, excerpted from *Ms. A*, where he sides with painting against sculpture, as he always does. The original setting of Leonardo's polemical comparisons of the arts is discussed further in Chapter Two. Puteolano's formulaic praise of letters is also very similar to Borromeo's Proem to his *Musaeum*, also discussed in Chapter Two.

³⁴ Pedretti, *Commentary*, 2: 76 ff. cites Lomazzo's testimony; see reference to Lomazzo in n. 70.

³⁵ This lost notebook has been reconstructed from passages included in the *Codex Urbinas* by Pedretti, *Libro A*, where the *Paragone* is discussed (232–238); see further his *Commentary*, 1: 76–86.

³⁶ For example, C/A 277 v–a; discussed in CNs 22 and 42.

the two extensive comparisons of the arts preserved in *Ms. A* and included as Chapters 19 and 38 of the *Parte Prima*. The comparisons of the arts that are known to be later, such as those excerpted from *Libro A*, ca. 1508–1510, are schematized versions of his earlier arguments that eliminate literary allusions and instead elaborate upon issues arising from studio practice and scientific observation, such as the manner in which shadows and contours represent varying distances from the eye (see *Parte Prima*, Chapter 45).

The present form of the *Paragone* is due to the efforts of an anonymous editor, probably Leonardo's student and heir Francesco Melzi, who must have compiled the *Codex Urbinas* during the decades when the debates on the preeminence of the arts were most popular in Italy. Melzi may have begun his compilation as early as 1520; it was complete by his death around 1570, a dating confirmed by internal evidence. Unfortunately, other than the internal evidence that two editors made revisions on the original manuscript, suggesting publication was planned, we know practically nothing about Melzi and his possible collaborators, or plans to publish the *Codex Urbinas* in the sixteenth century. The *Codex Urbinas* apparently never circulated, although abridged copies of the *Trattato* without the *Parte Prima* did.³⁷

The authenticity of the passages compiled in the *Codex Urbinas* has never been doubted, but their status has been uncertain, since the manuscript has never been systematically compared with writings extant in Leonardo's own hand, although it has been published several times since the first edition appeared in 1817. Indeed, such a study has become possible only since the recent ordering of Leonardo's fragmentary literary remains by Anna Maria Brizio and Carlo Pedretti, and other specialized studies of Leonardo's optics that have also focused on the manuscript evidence.³⁸ The present study systematically compares the contents of the *Parte Prima* to Leonardo's notes on painting. It provides a critical transcription newly made from the original manuscript, and a new English translation.³⁹ Its main aim has been to establish the

³⁷ The abridged copies and publications of the *Codex Urbinas* are discussed in the introduction to the text and translation.

³⁸ In addition to the studies already cited by Brizio and Pedretti in the Consolidated Bibliography, valuable contributions to our understanding of Leonardo's optics have been made recently by Lindberg, *Theories of Vision*, 154–168; Kemp, "Leonardo and the Visual Pyramid"; Ackerman, "Leonardo's Eye"; Strong, *Leonardo on the Eye*, among others.

³⁹ Previous English translations have been published by Irma Richter (1st ed., 1939) and A.P. McMahon (1956). A new partial translation by Martin Kemp and Margaret Walker (1989) has also been incorporated into the present study, and I am grateful to Martin Kemp for making his study available to me in manuscript.

relationship of the passages compiled in the *Parte Prima* to Leonardo's other writings, and thereby to make them more accessible.

Problems of language are primary to the critical interpretation of any text, but they are particularly acute in the present case. Complicated relationships exist among the *Parte Prima* texts and their sources, which include textual traditions Leonardo may not have known directly or may have known through an oral tradition. The primary considerations have been to account for Leonardo's scientific terminology, the highly contrived form of his rhetorical argumentation, and the role played by his original sixteenth-century compilers.

LEONARDO'S WRITINGS IN THE HISTORY OF THE PARAGONE

The Sixteenth Century

Even today we discuss the specific nature of each particular art in the formal vocabulary Leonardo largely developed, yet the contact of later Renaissance artists and *litterati* with his writings is just beginning to be seriously investigated.⁴⁰ A cluster of writers can be directly associated with Leonardo's presence at the Court of Milan, but there is scant evidence of any widespread literary dispute on the merits of painting and sculpture until the middle years of the sixteenth century, when a variety of writings, by Paolo Pino, Ludovico Dolce, Antonfrancesco Doni, Vincenzo Borghini, Benvenuto Cellini, Alessandro Allori, Francisco de Hollanda, and Giorgio Vasari—to name only the best-known authors—testify to the popularity of artistic controversies associated with the rivalry of painting and sculpture.⁴¹ Leonardo's defense of painting may have been known in other forms as well, but his views definitely were disseminated widely when Baldassare Castiglione's *Il libro del Cortegiano* was first published in 1528. This fictionalized account of courtly conduct, in a polite debate led by Signora Emilia Pia, repeats several of Leonardo's arguments on the rivalry of the arts almost

Significant variations of previous English translations of Leonardo's manuscript are cited in the Reader's Notes.

⁴⁰ Panofsky, *Galileo*, 4, citing paired concepts such as "sculptural" and "pictorial," "volume" and "space," "one view composition" and "multiview composition," was apparently the first to note the importance of the literary rivalries between painting and sculpture as a source of modern formal vocabulary.

⁴¹ An excellent account of sixteenth-century publications on art theoretical issues that considers Leonardo's contribution, is Pardo, "Paolo Pino's 'Dialogo di Pittura,'" 36–60, especially valuable for the connections drawn between North and Central Italian writers. Pardo argues that Vasari, Pino, Doni, Dolce, Aretino, and others were responding to each other's publications more than we have realized.

verbatim, including his defense of painting as a mathematical science based on perspective.⁴² The publication of Castiglione's book may account for the dissemination of Leonardo's polemical comparisons of the arts. There is other evidence, however, that Leonardo's writings were studied by the middle decades of the Cinquecento. The first posthumous reference to them, specifically to his scientific knowledge of anatomy and "the principles of distribution of light and shade," occurred in Paolo Giovio's biography of Leonardo, written around 1527.⁴³ Cellini, in his *Discorso dell'architettura*, recorded his first-hand acquaintance by 1542 with Leonardo's writings on perspective and the comparisons of the arts.⁴⁴ Carlo Pedretti has suggested that Cellini owned a manuscript prepared in France for Leonardo's student and heir Francesco Melzi.⁴⁵ Cellini lent this to the architect Sebastiano Serlio, who was also in the employ of Francis I. Cellini's copy of Leonardo's manuscript (now lost) may be that recorded in an account of the "Sforza Academy" as belonging in 1619 to Guido Mazenta, who owned other, original manuscripts by Leonardo.⁴⁶ Vasari also reported that in 1564 he was visited by a certain Milanese painter who had original Leonardo writings that he wished to publish.⁴⁷

⁴² Castiglione, *Il libro del Cortegiano*, Book 1, Chapters 49–52. Since Castiglione served Duke Lodovico Sforza in Milan from 1496 to 1499, he may have heard the arguments directly from Leonardo. On Castiglione's sources, see Maier, Introduction, *Il libro del Cortegiano*, 1955; on Castiglione's experiences at the Sforza court, see Vasoli, "Il Cortigiano, il diplomatico, il principe." See discussion of the arguments in Chapter Two, and CNs 19, 16, and 27.

⁴³ Giovio's short but rich biography in Latin was first published by Tiraboschi, *Storia della letteratura italiana* (Venice, 1796, 8, part 4, 1641–1642), cited here from the English translation in *The Literary Works of Leonardo da Vinci*, ed. J.P. Richter, 1: 3. A fragment of dialogue that Giovio wrote to introduce his biographies also refers to Leonardo; this passage is reprinted by Pedretti, *Commentary*, 1: 9–11. As Pardo, "Paolo Pino's Dialogo di Pittura," 51, notes, Giovio should be a reliable source since he must have been personally acquainted with Leonardo during the years 1513–1516, when Giovio was the official historian at the Court of Leo X, and Leonardo was in the Belvedere apartments granted to him by Giuliano de' Medici, revising anatomical treatises for publication that Giovio claims to have seen. A few years after Giovio wrote his biography, the architect Caporali referred to Leonardo's two-point perspective system, in his commentary to Vitruvius published in 1536, p. 16 (cited by Pedretti, *Libro A*, 172).

⁴⁴ B. Cellini, *Discorso dell'architettura* (*Opere*, ed. Maier, 852–863, citing Leonardo on 858–860). The date of 1542 is based on Cellini's testimony that he acquired the manuscript in France (see discussion by Pedretti, *Commentary*, 2: 395; also Steinitz, *Leonardo da Vinci's Trattato*, 25–26).

⁴⁵ Pedretti, *Commentary*, 2: 395.

⁴⁶ Gerolamo Borsieri, *Il supplimento della nobiltà di Milano* (Milan, 1619), 57–58, cited by Pedretti, *Commentary*, 2: 395.

⁴⁷ Vasari, *Vite*, 4: 28. Vasari's testimony was first discussed by Clark, *Leonardo da Vinci* 126; see recently, Rosci, "Leonardo 'filosofo,'" 58ff., a reference I owe to Carlo Pedretti. Pedretti, *Libro A*, 258, suggested (on the basis of slight evidence in

This might have been a version of Leonardo's so-called treatise on painting, perhaps even the *Codex Urbinas*.⁴⁸

Vasari claimed that his *Lives* germinated in "bellissimi ed ornati ragionamenti" at the court of Cardinal Farnese in Rome and in response to Paolo Giovio's *Museo* and book of "Elogie."⁴⁹ The most famous document connected with the Renaissance rivalry of painting and sculpture is undoubtedly Benedetto Varchi's 1546 questionnaire to seven artists and literary figures including Cellini and Michelangelo. The letters by Varchi's respondents, in which each praised the superiority of his own profession, provide important evidence that arguments Leonardo apparently invented were known in some detail in the mid-sixteenth century.⁵⁰ In 1564, differences of opinion among emulous artists were serious enough to divide the membership of the newly founded Florentine Accademia del Disegno over elaborate preparations for Michelangelo's funeral.

the present writer's opinion) that the anonymous painter might be Gian Paolo Lomazzo.

⁴⁸ Pedretti, *Commentary*, 1: 23, notes that the project of the anonymous Milanese painter could have been independent of Melzi's compilation, since Vasari mentioned an original manuscript.

⁴⁹ Brizio, "La prima e la seconda edizione," 83, discusses how Giovio's "museum" at his villa in Como and his *Elogie*, published in Venice, 1546, provided the model for Vasari's future work. In the 1568 edition of his own biography, (*Le Vite*, ed. Milanese, 7: 681), Vasari cites the evening in 1546 when Giovio confessed that he had always wished to gather together in a treatise "nel qual si regionasse degli uomini illustri dell'arte del disegno, stati da Cimabue, insino ai tempi nostri." Frey, *Carteggio*, 211–213, discusses the inconclusive evidence for the circumstances under which the *Lives* were composed. A long tradition of artistic biography is associated particularly with Florentine writers; see von Schlosser, *La letteratura artistica*, 99–119.

⁵⁰ The changing status of the arts is the subject of Chapter Four. For an introduction to the changing social status of the artist, see Barzman, "Liberal Academicians and the New Social Elite in Grand Ducal Florence," in *World Art* 2: 459–463. For the most recent discussion on the publication of Varchi's volume in 1550, see Quiviger, "Benedetto Varchi and the Visual Arts." See also Mendelsohn, *Paragoni*, 89 ff. Frey, *Carteggio*, 191, discusses the chronology of events beginning with Varchi's questionnaire and lecture at the Accademia Fiorentina in 1547, in which he incorporated some comments by the respondents who were Vasari, Bronzino, Pontormo, Battista Tasso, Francesco Sangallo, Niccolò Tribolo, Cellini, and Michelangelo; texts are available in *Scritti*, 3: 493–523; and Varchi's text, 3: 524–544. According to Pedretti, "Le note di pittura di Leonardo," 231, n. 3, Carducho (*Dialogos de la Pintura*, Madrid, 1633), who knew Leonardo's ideas on the subject from Lomazzo's report, and equated them with Varchi's reasons, was probably the first to refer to Leonardo as the object of Michelangelo's criticism in response to Varchi's questionnaire. Carducho's discussion is reproduced in Pedretti, *Commentary*, 1: 85–86, but Pedretti's translation makes it appear (erroneously) that Michelangelo identified Leonardo as the object of his diatribe. I thank Mary Pardo for clarifying the texts for me. According to Barocchi, "Una 'Selva di notizie,'" 110, Vincenzo Borghini believed that Michelangelo's reference was actually to Castiglione's *Il Cortegiano*. However, Hope, in "What Michelangelo Had in Mind," notes that although Borghini thought Michelangelo was

The program for that ceremony, which included a catafalque with personified allegories of painting, sculpture, architecture, and poetry, was planned largely by Vasari—and nearly sabotaged by Cellini.⁵¹

Like Varchi and several of the artists he had canvassed twenty years earlier, Vasari, in his second (1568) edition of the *Lives*, resolved the rivalry between painting and sculpture in favor of the common foundation of the arts in *disegno*.⁵² Interest in the contest declined in the years following Vasari's publication. Raffaello Borghini's *Il Riposo* of 1584, which also refers to unpublished writings by Leonardo, includes one of the last literary debates on the subject; it is gathered in an encyclopedic review of familiar arguments, without burning commitment to the issues.⁵³

During the middle years of the Cinquecento, literary and artistic disputes ran parallel courses in defining new art forms autonomously. At this time literary issues took a decisive turn towards the theoretical, in large measure through the incorporation of Aristotle's *Poetics* into the rhetorical tradition of literary criticism.⁵⁴ Practical criticism of both art and literature influenced the theory of individual genres and the classification of critical issues. Literary debates such as those between Bembo and Poliziano at the opening of the century, and especially the debates on Tasso and Ariosto at the end of the century, are somewhat comparable to the polemics on the visual arts.⁵⁵

referring to Castiglione, Michelangelo's remark "could equally well have been directed at Vasari." Hope, 248–249, adds that Michelangelo's letter does not reveal that he knew *Il Cortegiano* at firsthand. Whatever the immediate source of knowledge of Varchi's respondents, they were familiar with arguments first put forward by Leonardo in passages we know from the *Parte Prima* of the *Codex Urbino* 1270.

⁵¹ Cellini claimed that Vasari's program gave unwarranted priority to painting over sculpture. See discussion and reprinted texts in R. and M. Wittkower, *The Divine Michelangelo*, 20, 156ff., on Cellini. Allegorical personifications of the individual visual arts were not known before the sixteenth century; see further discussion in Chapter Four.

⁵² Vasari, *Le Vite*, ed. Milanesi, 1: 91–106.

⁵³ R. Borghini, *Il Riposo*, 25 ff. See further, Rosci, "Leonardo 'filosofo,'" 72ff. The effects of the Counter Reformation on the rivalry of painting and sculpture have not been adequately investigated; but see discussion of Gabriel Paleotti in Summers, *The Judgment of Sense*, 145–146.

⁵⁴ Modern stylistic criticism is fundamentally indebted to texts introduced in the sixteenth century. Hermogenes and Aristotle's *Poetics*, for example, were practically unknown in the Quattrocento; see Monfasani, *George of Trebizond*, 325, on the role of Hermogenes. The groundwork for a comparative study of humanist discussions of method and scientific artistic practices has been prepared by several recent contributions: see references to Gilbert (1960); Scaglione; Rescher; Nuchelmans; and Sabbadini, cited in the Consolidated Bibliography.

⁵⁵ See Weinberg, *Literary Criticism in the Italian Renaissance*; Kristeller, "The Modern System of the Arts." Pomponius Gauricus, Ludovico Dolce, Sperone

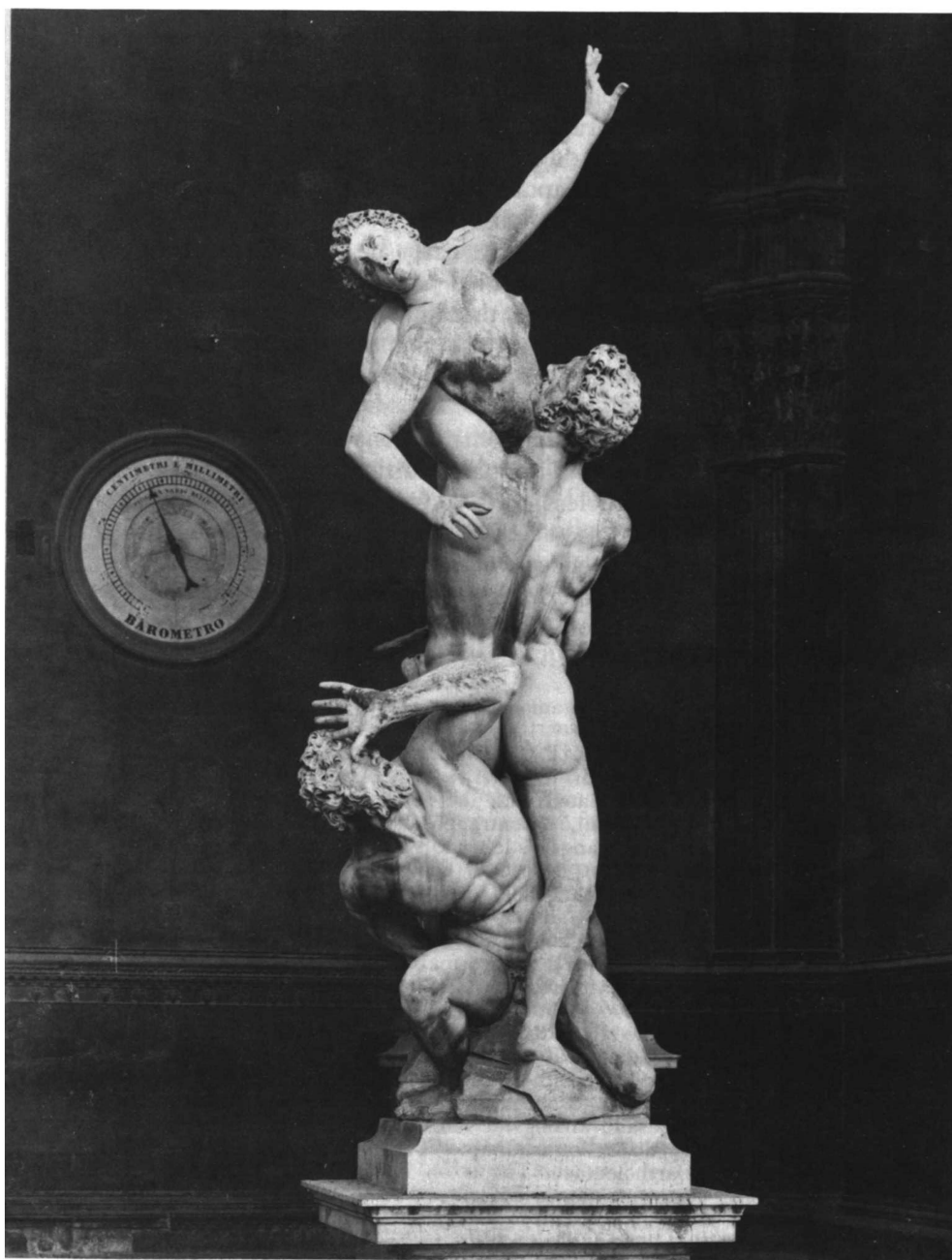
Artistic rivalries are legendary throughout the Renaissance, and notions of artistic competition are an important ingredient of the "paragone" tradition. Dolce, for example, cast Leonardo, Raphael, and Titian as Michelangelo's rivals in his *L'Aretino*, a literary fiction. We assume that "paragoni" were carried out often in actual practice, although Giovanni da Bologna's *Rape of the Sabines* is one of the rare visual examples, apart from scattered but important evidence recorded by Vasari, which can be documented as part of the polemical debate (Figure 2).⁵⁶ As early as 1456 Bartolommeo Fazio described Jan van Eyck's fabled painting of a female nude depicted in mirrored views in terms that immediately bring to mind Paolo Pino and Vasari's high praise for the way Giorgione's *St. George* surpasses sculpture, but unfortunately the works themselves are lost.⁵⁷

Our ability to recognize visual contributions to the debate now depends to a great extent on a textual tradition that rarely names actual productions. Nonetheless, a visual tradition no doubt existed and can probably be traced to sculpture simulated in painting and experiments with pictorial effects in relief sculpture beginning in the early Quattrocento and perhaps even earlier. Donatello's reinterpretation of low relief, or Ghiberti's panels for the Florence

Speroni, and Benedetto Varchi are among the writers who contributed to both literary and artistic criticism.

⁵⁶ See Shearman, *Mannerism*, 162 ff., on Giovanni da Bologna's *Rape* and the debate literature associated with it. The texts are reprinted in *Scritti*, 5: 1211–1242. Artistic issues associated with the *Paragone* are also discussed by Summers, "Maniera and Movement," "Contrapposto," and especially "Figure come fratelli"; with reference to Michelangelo's letter to Varchi, "Paragone," in *Michelangelo*, 269–278. Holderbaum, "A Bronze by Giovanni da Bologna," cites the most important references by Vasari. Held, "Artis Pictoriae Amator," discusses the seventeenth-century pictorial tradition with some references to Renaissance precedents. Titian's early painting known as "La Schiavona," which depicts an unidentified woman presented with a feigned marble relief portrait of herself in profile, has been cited as key evidence of a visual tradition contemporary with Leonardo's polemical defense of painting: see Freedman, "The Schiavona." Onians, "On How to Listen to High Renaissance Art" extends the principle of the "paragone" to a general reading of Renaissance art, especially with reference to musical harmony. The related sixteenth-century phenomenon of painted *poesia* has evoked too many contributions to cite here; among the first is Gilbert, "On Subject and Non-Subject," and among the most recent, Land, "Ekphrasis and Imagination." See further discussion in Chapter Two.

⁵⁷ See Baxandall, "Bartholomaeus Facius on Painting," 102–103, on van Eyck's lost painting. Vasari mentioned Giorgione's demonstration in the preface to his 1568 edition of the *Lives*, commenting that the painting resulted from a discussion among friends before Verrocchio's *Colleoni* monument (*Le Vite*, ed. Bettarini and Barocchi, 3: 46). Paolo Pino referred to a slightly different version of the same story in his *Dialogo di Pittura* (Venice, 1548, 36), excerpted in *Scritti* 3: 548–553.



Ill. 2. Giovanni da Bologna. *Rape of the Sabine Woman*. Before 1583. Marble. Florence, Loggia dei Lanzi.



III. 3. Attributed to Jan Miel. *A blind man comparing painting and sculpture*. Turin, Galleria Sabauda.

Baptistery, may record early claims for the supremacy of one visual art form over another.⁵⁸ There is convincing evidence that a visual tradition for representing the rivalry of the arts closely related to allegories of the five special senses existed in the sixteenth and especially the seventeenth century. One such painting, by Jan Miel (Figure 3), has even been identified by Peter Hecht as depicting an incident attributed to Leonardo by the early seventeenth-century writer Ambrogio Mazenta.⁵⁹ Perhaps the mock-serious episode of a blind man judging a painting and a sculpture by touch does originate with Leonardo, but it is also possible that the visual and literary versions of the story merely have a common source. While the specific demonstration recorded by Mazenta does not correspond exactly with any of the *Parte Prima* passages, Leonardo did incorporate similar queries derived from poetic contest literature. These *tenzons*, like Leonardo's variations, play upon the neoplatonic hierarchy of the senses that posits sight as the most spiritual and therefore the most noble sense, while touch, being the most material in its function, is the least noble. Visual "paragoni" like Jan Miel's painting demonstrating the superiority of painting over sculpture must therefore be parodies of good judgment, since the contest is judged by touch. The outcome of literary contests is traditionally variable, however, depending upon the ingenuity of the contestants. As the following chapter will elaborate, Leonardo's comparisons of the arts reflect these poetic precedents most significantly in that his arguments similarly revolve around issues of judgment, like the merit of the artist's *ingegno* and his artifice.

According to one argument often credited to Leonardo, and repeated in several *Parte Prima* passages, sculpture imitated in paint—far from deserving scorn because it deceives the eye—is a more noble invention than actual sculptural relief because it depends on the artist's knowledge of the science of optics. By the

⁵⁸ On Manetti's description of Brunelleschi's panels, see CN 37. Cahn, *Masterpieces*, includes an interesting discussion of competitive practices associated with guilds. See further discussion in Chapter Two.

⁵⁹ Peter Hecht, "The *paragone* debate," 134 (and figure 9), discusses Jan Miel's painting now in Turin (Galleria Sabauda). Mazenta owned original manuscripts and recorded a contest between painting and sculpture involving Leonardo in his *Le Memorie su Leonardo da Vinci*, 41 (Pedretti, *Libro A*, 122, n. 67, provides an English translation). On the visual tradition for representing the allegories of the special senses, see Nordenfalk, "The Five Senses." For a seventeenth-century literary example based on the differences between imitation and actual relief, see Agucchi's extended discussion of painting imitating stucco, reprinted in Mahon, *Seicento Art and Theory*, 266. For contemporaneous visual examples, see Winner, "Annibale Carracci's Self-Portraits and the Paragone Debate," in *World Art* 2: 509–515.

mid-sixteenth century, if not earlier, the scientific training of artists was conceived along the lines of a liberal education close to Leonardo's definition of painting as natural philosophy. Leonardo's writings on pictorial perspective, the foundation of his polemical defense of painting, are historically significant in this connection. Arguments for the liberal status of the visual arts were set out in a fully Aristotelian framework by midsixteenth-century writers such as Daniele Barbaro, Benedetto Varchi, and Vincenzo Borghini—all of whom were close to artists, especially those associated with the Florentine Accademia del Disegno.⁶⁰

Recent studies of artistic training in the sixteenth century, such as Charles Dempsey's assessment that the Florentine Academy served as a model for other formalized academies of art, or David Rosand's account of artistic manuals associated with Venetian art education, have focused on the unprecedented importance of humanistic models for artistic education.⁶¹ Without doubt, literary humanism was an essential factor contributing to the increasingly liberal status of the visual arts in general, but it is important to bear in mind that students at the Florentine Accademia and elsewhere were meant to receive scientific training in mathematical subjects including perspective, and in anatomy. In the preface to Ignazio Danti's Italian edition of Euclid's *Optica*, for example, his publishers specifically state that the translation is intended for artists at the Accademia del disegno di Perugia.⁶² Danti's translation is in the same tradition, therefore, as writings by Leonardo, Alessandro Allori, Cellini, and the statutes of the Florentine Academy itself.⁶³

⁶⁰ For the personalities, see Mendelsohn, *Paragoni*. These arguments are discussed in Chapter Four. Varchi's arguments are discussed more fully by Summers, *Michelangelo*, 203–233, and *The Judgment of Sense*, 227–234.

⁶¹ Dempsey, "The Education of Artists," 559 ff., stresses that artists in the later sixteenth century had the benefit of a humanistic grammar school education; Rosand, "The Crisis of the Venetian Renaissance Tradition." For an overview of teaching practices in early art academies, see [Providence], Brown University, *Children of Mercury*, which includes an excellent bibliography.

⁶² F. and I. Giunti, Introduction, *La Prospettiva di Euclide*, n.p.: "Et benche, S. Rx [Danti] le havesse semplicemente tradotte per commodo della sua scuola . . . Parendoli potersi sperare, che tanto honorata professione del disegno fondata sopra le Matematiche, sia per ritornar di nuovo, come già fu, in huomini non solo per chiarezza d'igegno; ma ancora per nobilità di langue illustri. . ."

⁶³ The regulations of 1562 are published in Pevsner, *Academies of Art*, 296 ff.; for the complete text of the regulations, see Reynolds, "The Accademia del Disegno in Florence," 135–137. See also, Goldstein, "Vasari and the Florentine Accademia," and for a different opinion about the evidence for the sixteenth-century academy as a teaching institution, *Visual Fact Over Verbal Fiction*, 78–88, with a useful summary of the scholarship; Cellini, *Opere*; Allori, "Il primo libro de' Ragionamenti delle regole del disegno d'Alessandro Allori con M. Agnolo Bronzino," reproduced in *Scritti*, 8: 1941–1982.

Although his flawed description suggests that he never consulted Leonardo's writings on optics, Serlio praised Leonardo's (and Peruzzi's) demonstration of perspective in his architectural treatise, published in 1545.⁶⁴ Whatever manuscript Cellini owned, his praise of Leonardo's contribution to pictorial perspective and Serlio's second-hand testimony testify to interest in Leonardo's optics by major mid-sixteenth-century artists. There is also a report by Vasari that around 1530 Guglielmo della Porta was in Rome studying Leonardo and owned the *Codex Leicester-Hammer*, a treatise on water movement.⁶⁵ In his 1551 *De subtilitate* Gerolamo Cardano included scientific notes on painting that strongly resemble Leonardo's ideas.⁶⁶

Evidence of interest in Leonardo's scientific writings is richer from the later sixteenth century. According to Pedretti, at least four manuscript copies of the (abridged) treatise on painting were known in Florence around 1580.⁶⁷ Significantly, a sixteenth-

⁶⁴ Serlio, *Tutte le opere*, 30. Cellini wrote that Serlio intended to publish Leonardo's books on perspective, which included a rule for foreshortening "longitude as well as latitude and altitude" (*Opere*, 860, excerpted in Pedretti, *Commentary* 1: 67). Further evidence of the dissemination of Leonardo's writings is provided by Agrippa, *Trattato di scientia d'arme*, 1553, which begins by comparing fencing to discourse in terms that immediately call to mind Leonardo's definition of painting as a mathematical science in the first chapters of the *Codex Urbinas*.

⁶⁵ Vasari, *Le Vite*, ed. Milanese, 3: 843.

⁶⁶ Cardano, *De Subtilitate*, cap. 17 (*Opera Omnia*, 3: 609–610); first noted by Duhem, *Études sur Léonard de Vinci*, 229–234. Pedretti, *Commentary*, 1: 33–34, attributed Cardano's discussion to his knowledge of Leonardo's writings, but until the history of writings on optics in the tradition of natural science is better understood, attributions must be approached cautiously. As early as the 1450s, Giovanni Fontana recorded his association with the painter Jacopo Bellini, whom he instructed in optics based on Aristotle's *Meteorologia* (see Canova, "Riflessioni su Jacopo Bellini"). Not many years after Cardano's publication, Egnazio Danti published an edition of Euclid's *Optics* (see n. 62) that incorporated material from the natural sciences: "Prospettiva, che il raggio visibile, che passa per mezzi diversi, come per l'aria pura, et per la densa, et per l'aria, et per l'acqua come anco per l'aria, et per il fuoco. . . et variamente pare che mutino nol solo sito, ma la figura, la grandezza, il colore, et la distanza, come facilmente si puo vedere per quelle cose, che si veggono in diverse qualità di arià, et per il vetro, et per l'acqua, oper simili corpi diafani, et trasparenti. Mostraci anco la Prospettiva, che delle cose, che si muovono, quelle che sono più lontane, appariscono di più tardo moto. . . Et come potranno mai essere conosciute, et intese le *Meteore* di Aristotele senza l'aiuto della prospettiva?" (Danti, preface, Euclid, *La Prospettiva*, Florence, 1573, n.p.).

⁶⁷ Pedretti, *Commentary*, 1: 32–38, also states that the library of the Accademia has a sixteenth-century copy belonging to the same family of manuscripts; see also Pedretti's important discussion of other abridged copies, *Commentary*, 1: 14–36. Kate Steinitz, *Leonardo da Vinci's Trattato*, has published an extensive list of sixteenth- and seventeenth-century manuscript copies of the *Trattato* owned by artists and amateurs, but this evidence remains to be studied. Steinitz lists 23 abridged versions of the treatise on painting not dependent upon the first printed

century copy of the *Trattato* was in the library of the Florentine Accademia del Disegno.⁶⁸ A number of sixteenth-century artists also compiled notes on perspective in the form of workshop manuals; the evidence, although incomplete, suggests that they drew upon the same sources, and thus belong to the same scientific tradition as Leonardo and other fifteenth-century writers.⁶⁹ In 1584—the same year as Raffaello Borghini's references, mentioned above—Gian Paolo Lomazzo included extensive excerpts from Leonardo's writings, otherwise lost to us, in his *Trattato dell'arte de la pittura, scoltura et architettura*.⁷⁰ Not long thereafter, in his *L'idea dei scultori, pittori e architetti*, published in 1607, Federico Zuccaro criticized Leonardo's treatment of mathematical perspective and referred to autograph writings on movement paraphrased in the *Codex Huygens*.⁷¹

The Leonardo manuscript Cellini owned has sometimes mistakenly been identified with the *Codex Huygens*, composed around 1560–1570 and based closely on Leonardo's writings.⁷² The sources and authorship of the *Codex Huygens* have puzzled generations of scholars. Lately it has been demonstrated that Carlo Urbino, an artist who was also associated with Melzi's *Codex Urbinas* project, compiled the handbook though he was not, strictly speaking, its author.⁷³ This treatise includes an extensive account of linear

edition of 1651. She has published supplements in the *Raccolta Vinciana*: "Bibliography never ends," and "Trattato Studies II." The Belt Library of Vinciana, University of California at Los Angeles, includes a collection of photographic copies of the manuscripts.

⁶⁸ See n. 67.

⁶⁹ Zöllner, "Agrippa, Leonardo and the Codex Huygens," and Marinelli, "The Author of the Codex Huygens," have collected significant evidence on the extent of this tradition. See following discussion on the *Codex Huygens*.

⁷⁰ Lomazzo, *Trattato dell'Arte de la Pittura*, 158–160; reprinted in Lomazzo, *Scritti sulle arti*, 2: 138–140; excerpted in Pedretti, *Commentary*, 1: 76–79. Other parts of Lomazzo's treatise, such as Books 3 and 4, on color and the effects of light, respectively, also recall Leonardo's investigations in the natural science of perspective.

⁷¹ Zuccaro, *L'idea dei pittori, scultori ed architetti*, 2: 13 excerpted by Pedretti, *Commentary*, 1: 50, n. 2; and published in English translation, *Libro A*, 72. As I. Richter, *Paragone*, 92, notes, Zuccaro stated that he was determined to "banish these fruitless quarrels," but not before he gave the palm to painting for being more directly related to "Disegno Interno." Steinitz, *Leonardo da Vinci's Trattato*, 64, lists an abridged version of the *Trattato*, presumably owned by Zuccaro or his school, *Manuscript 297* in the Biblioteca Etrusca, Cortona.

⁷² On the *Codex Huygens*, see following note, and Pedretti, *Commentary*, 1: 48–75, especially p. 67, on its identification with Cellini's Leonardo manuscript.

⁷³ Ruggeri, "Carlo Urbino e il Codice Huygens," who accepted the recent attribution to Carlo, on stylistic grounds, cites the earlier arguments; and Marinelli, "The Author of the Codex Huygens," has discovered one engraved title page and corresponding drawing naming Carlo Urbino as the author of the *Codex Huygens*. Marinelli brings into focus a broad tradition (beginning with lost writings

perspective based on Vitruvius and Euclid and reminiscent of Leonardo's interests beginning around 1497. Echoes of it are found in a number of publications from the 1580s by Cristoforo Sorte, Bernardino Campi, Martino Bassi, Lomazzo, and others.⁷⁴ These late Cinquecento authors discuss, among other issues, the relative merits of geometrically constructed perspective projections compared to those constructed by workshop methods relying on practical devices and models, a subject of controversy that was important to Leonardo and also appears in the writings of Cellini.⁷⁵ These debates over pictorial perspective suggest that subjects Leonardo explored (on the basis of a tradition that can be traced at least as far back as Alberti's *Treatise on Painting* of 1435) were of enduring concern to practicing artists.⁷⁶

The Early Seventeenth Century

In his *Memorie* of 1635, Ambrogio Mazenta recorded that the Leonardo manuscripts that remained with Melzi were dispersed shortly after the latter's death.⁷⁷ Interest in Leonardo's writings accelerated rapidly around this time, no doubt encouraged by the new accessibility of the original notebooks. Along with other literary treasures, the Spanish sculptor Pompeo Leoni, a great speculator in Leonardo manuscripts, acquired fifteen notebooks from the Melzi estate.⁷⁸ By 1622 thirteen notebooks had been acquired by

by Vincenzo Foppa, Andrea Mantegna, Bernardo Zenale, and Bramantino). Zollner, "Agrippa, Leonardo and the Codex Huygens," has suggested that Agrippa von Nettesheim's *De occulta philosophia* (1533 edition) is indebted to Leonardo's proportional studies derived from Vitruvius, which Agrippa may have known from Gerolamo Figino, "who had access to the material copied into the *Codex Huygens*" (233). This evidence suggests additional ways in which ideas originating with Leonardo were disseminated.

⁷⁴ Sorte, *Osservazioni nella Pittura* (1580; Venice, 1594), 19–23; Campi, *Parere sopra la Pittura* (1584), reprinted in *Scritti*, 4: 931–935; Bassi, *Disparei in materia d'architettura et prospettiva*, . . . *pareri di eccellenti, et famosi Architetti* (Brescia, 1572), excerpted in *Scritti*, 7: 1799–1801. (I. Danti, ed., *Regole di Prospettiva del Vignola*, 1583, refers to "regole ordinati in compendio" by Leonardo cited by Rosci, "Leonardo filosofo," 71). Bassi and Lomazzo criticized Campi severely for his shortcut methods: see Bora, "La prospettiva"; and Marinelli, "The Author of the Codex Huygens," 218, who states that Campi was close to Carlo Urbino.

⁷⁵ Cellini, "Discorso sopra l'arte del disegno," reproduced in *Scritti*, 8: 1929–1933.

⁷⁶ Much earlier, Alberti, *della Pittura*, 3.58, recommended that students of painting study *rilievo* by copying statues. The issues are discussed in Chapter Four and the Commentary Notes on sculpture.

⁷⁷ Mazenta, *Le Memorie su Leonardo da Vinci*, 37–38. The history of the manuscripts has been published many times. See Pedretti, *Libro A*, 252–259. As Pedretti, *Commentary*, 2: 394, has pointed out, the details of Mazenta's account are not entirely reliable.

⁷⁸ See Pedretti, *Commentary*, 2: 394–395.

Count Galeazzo Arconati, who donated twelve of them to the Ambrosiana Library in Milan in 1637.⁷⁹

The Ambrosiana, founded in 1607 by Cardinal Federico Borromeo, became a rich depository for Leonardo holdings in the early seventeenth century. Federico combined his ardor for religious art with an inexhaustible enthusiasm for science, as attested by the library of thirty thousand printed volumes and fourteen thousand manuscripts he furnished the Ambrosiana.⁸⁰ Among these manuscripts were an early copy of Leonardo's *Trattato* (the *Codex Pinellianus* of 1585), and Leonardo's early manuscript on optics known as *Ms. C*.⁸¹ By 1637 the Ambrosiana owned at least thirteen important notebooks by Leonardo, including three original manuscripts on optics, more recent copies of other writings on optics, and an excellent copy of the *Trattato*.

Interest in Leonardo's writings on optics produced documentary evidence in other quarters as well. In 1612 Galileo wrote a letter to his friend the Florentine painter Ludovico Cigoli in Rome concerning the relative merits of painting and sculpture.⁸² Galileo's witty defense of painting is particularly close to an argument Leonardo recorded in *Libro A*, the lost notebook that Pedretti reconstructed from passages included in the *Trattato*, and dated ca. 1508–1510.⁸³ Galileo's argument that the artifice of sculpture depends on the aid of natural light certainly corresponds with Leonardo's studies of shadow projection in the period beginning around 1505. Cigoli also wrote a treatise on practical perspective, an unpublished manuscript now in the Uffizi, with a number of indisputable references to Leonardo's *Trattato*, and Galileo elsewhere refers to Leonardo's

⁷⁹ The date of sale to Arconati is based on a receipt published by Grammatica, discussed by Bell, "Cassiano dal Pozzo's Copy of the Zaccolini Manuscripts," 120, n. 46. In 1614, Leoni's heirs offered the thirteen notebooks to Cosimo II, who declined to buy them. The 1614 inventory of Leoni's estate and related correspondence with Cosimo II have been published by Pedretti, *Commentary*, 2: 396–397.

⁸⁰ See Quint, *Cardinal Federico Borromeo*, 21, on the size of Borromeo's library; 22–27, on his collection of Leonardo materials.

⁸¹ Borromeo may have acquired *Ms. C* as a gift from Guido Mazenta in 1603 along with another treatise bound in the same volume, the late optical manuscript *Libro W* (now lost), used in the compilation of the *Codex Urbinas* and last known in this connection. As recently as 1958, a Leonardo manuscript was seen in the library of one of the Princes Borromeo, so perhaps the important *Libro W* still exists (see Pedretti, *Commentary*, 1: 151, and *Libro A*, 147 and 252).

⁸² See Panofsky, *Galileo*, 6 ff.

⁸³ Panofsky, *Galileo*, 27–28, citing Galileo, *Opere*, 8: 60, to argue for the similarity between Galileo's theory of human movements as a system of circles and epicycles and writings by Leonardo known from the *Trattato*, the *Codex Huygens*, and notes extant in his own hand. Compare *Parte Prima*, Chapter 45 (Pedretti, *Libro A*, 38–39 (Carta 17.18)). As Pedretti, *Libro A*, 39, n. 19, notes, Panofsky, *Galileo*, 9, believed Galileo's argument to be original.

precepts.⁸⁴ Furthermore, the argument Galileo used was repeated by a teacher at the Florentine Accademia del Disegno and friend of both Galileo and Cigoli: Pietro Accolti concluded his *Lo Ighanno de gl'occhi, prospettiva pratica*, a treatise on perspective published in Florence in 1625, with a lengthy discourse appropriated from the abridged *Trattato*, although Accolti does not name his source, and other parts of his treatise, especially the third book devoted to the study of light and shadow, are in the tradition of Leonardo's science of *chiaro e scuro*.⁸⁵

The abridged *Trattato*, and perhaps other writings by Leonardo on perspective, circulated before and after its initial publication in 1651. Interest in both Florence and Milan can be connected with Rome, the center of activities concerning Leonardo's manuscripts at the beginning of the Seicento. As early as 1618, Matteo Zaccolini, a member of the orthodox Theatine Order, was composing a lengthy illustrated commentary on Leonardo's writings on optics (in the same forthright language as Danti's Italian translation of Euclid's *Optics*) that focused on the subjects of color and shadow projection.⁸⁶ There can be no doubt from the internal evidence of his recently rediscovered writings that Zaccolini knew Leonardo's notes firsthand. Recently, the Zaccolini manuscripts have also been connected with Poussin's study of Leonardo's pictorial perspective in the 1640s.⁸⁷

⁸⁴ Cigoli, "Prospettiva pratica. . . demonstrata con tre regole, e la descrizione di sue strumenti. . .," *Codice 2660A*, Gabinetto dei Disegni e delle Stampe degli Uffizi, Florence; see M. Kemp, *The Science of Art*, 97. An edition is planned by Filippo Camerota, Miles Chappell, and Martin Kemp. Cigoli's treatise is also cited in Pedretti, *Commentary*, 1: 43, n. 3. On the relationship between Cigoli and Galileo, see Edgerton, "Galileo, Florentine 'Disegno,' and the 'Strange Spottedness' of the Moon."

⁸⁵ Pedretti, *Commentary* 1: 35 claims that this work is effectively the first publication of Leonardo's writings, although it did not appear under his own name. Other parts of Accolti's treatise, especially the third book devoted to the study of light and shadow, are in the tradition of Leonardo's science of *chiaro e scuro* and probably directly indebted to his writings. As Strong, *Leonardo on the Eye*, 235, notes, Accolti, 174, claimed that his treatise on perspective was the first to include a discussion of light and shade. However, Danti's 1573 edition of Euclid's *Prospettiva* and Lomazzo's *Trattato del Arte de la Pittura*, 1584, have precedence. It cannot be overemphasized that at the present incomplete stage of our knowledge, the history of the dissemination of Leonardo's writings on pictorial perspective defined as a natural science is filled with conjecture.

⁸⁶ The four illustrated volumes were rediscovered in 1973 by Carlo Pedretti, "The Zaccolini Manuscripts"; see further, *Commentary*, 1: 36–43. The manuscripts have since been studied by Cropper, "Poussin and Leonardo"; and Bell, "Cassiano dal Pozzo's Copy of the Zaccolini Manuscripts," who revises Pedretti's interpretation of the existence of manuscript copies to argue that the rediscovered volumes are not the original manuscripts, but rather copies ordered by Cassiano. Bell is currently preparing an edition of Zaccolini's four-volume commentary.

⁸⁷ Cropper, "Poussin and Leonardo," 570 ff., has substantially revised the view that Poussin had a negative opinion of Leonardo's pictorial perspective.

It is well known that Zaccolini's patron Cassiano dal Pozzo, secretary to Cardinal Francesco Barberini, was a great enthusiast of the arts (Cigoli and Poussin were two of his favorite painters). But he also patronized the sciences, and he combined his dual interests in extensive efforts to make Leonardo's writings available to the public.⁸⁸ In connection with his plans to publish Leonardo's treatise on painting, supplemented by additional passages on optics, Cassiano was in touch with the collector of Leonardo manuscripts, Count Arconati in Milan. From Arconati, Cassiano learned of Federico Borromeo's Leonardo holdings, which he also utilized together with Zaccolini's commentary. A lengthy correspondence between Cassiano and Arconati reveals the extent to which they collaborated to produce an accurate edition of Leonardo's writings, checking texts against one another and creating new copies of Leonardo manuscripts in both Milan and Rome.⁸⁹ When this planned publication was abandoned at Urban VIII's death in 1644, Cassiano turned to France for further support and, while the supplements on optics never appeared, French and Italian editions of the abridged *Trattato*, with engravings after Poussin, were finally printed in 1651.⁹⁰

Scholars have only recently begun to investigate how Leonardo's writings might have contributed directly to pictorial inventions associated with new styles of scientific naturalism around the turn of the seventeenth century. Even though comparisons of the arts continued to be written, Leonardo's polemical defense of painting was less important to seventeenth-century theory and practice than his writings on pictorial optics and figurative decorum. The history of these artistic issues is the subject of the next three chapters.

⁸⁸ Haskell, *Patrons and Painters*, 98–119; Bell, "Cassiano dal Pozzo's Copy of the Zaccolini Manuscripts," focuses on the Leonardo project in this context. Bell's dissertation, "Color and Theory in Seicento Art" also treats the relationship between Zaccolini's study of Leonardo's optics and the project of his mentor Cassiano.

⁸⁹ Their correspondence was published by Carusi, "Lettere di Galeazzo Arconati e Cassiano dal Pozzo," reprinted in Steinitz, *Leonardo da Vinci's Trattato*, 218–229, along with descriptions of the manuscript copies produced in connection with Cassiano's project, pp. 70–93. Parts of the *Madrid Codex II*, *Mss. E and G*, *Libro A*, and the lost *Libro W* were compiled in the later books of the *Trattato*. Pedretti, *Libro A*, 175–225, provides a useful concordance of the manuscript sources. The early optical *Ms. C*, not used in the *Trattato* although it is listed as a source by the compilers of the *Codex Urbinas*, was also in Arconati's collection, and in the Ambrosiana Library after 1637.

⁹⁰ On this history, see Bell, "Cassiano dal Pozzo's Copy of the Zaccolini Manuscripts," 117, and on the history of the printed editions, Steinitz, *Leonardo da Vinci's Trattato*. The *Codex Urbinas* entered the collection of Urban VIII and was transferred to the Vatican in 1657: see the introduction to the *Parte Prima* texts.

CHAPTER TWO

THE RIVALRY OF THE ARTS IN LEONARDO'S TIME

Leonardo's comparisons of the arts constitute a new kind of art literature, one that falls somewhere between courtly literary fictions and humanist art criticism. Generally speaking, Renaissance comparisons of the arts are perhaps too diverse to be called an independent literary genre, but their varied formal types are interrelated, stemming from common sources in classical and medieval literature and probably reinforced by an oral tradition.

In addition to inventing a new kind of art literature, Leonardo took part in a historical debate on the reclassification of the arts and sciences by defending painting as a form of knowledge. In large part, we consider his *Paragone* significant to the history of the systematization of the fine arts because arguments against the individual arts of poetry, music, and sculpture that Leonardo invented were collected in the *Parte Prima* of the *Codex Urbinas*.¹ Even if the arrangement is due to his sixteenth-century editor, his arguments address substantive issues that span the literature on the comparison of the arts.

THE FORMAL SOURCES OF POLEMICAL COMPARISONS OF THE ARTS

Two developments in the rhetorical tradition were especially important in shaping the Renaissance debates on the status of the arts: dramatized forms of poetic contest, and the critical literature concerned with virtues of style. In terms of subject matter, there were no ancient debates on the status of the visual arts.² The ancient sources so often quoted by Renaissance writers compare painters and sculptors to poets and orators not in order to discuss the merits of visual art but as a way of explaining the exemplary qualities of literary prose.³ Ancient writers used words such as

¹ On this basis, Kristeller, "Modern System of the Arts," singled out Leonardo's scheme in the *Parte Prima* as the most complete classification of the fine arts from the Renaissance period.

² See the literature cited by Hagstrum, *The Sister Arts*, Chapter 1, "Classical Antiquity"; Kennedy, *The Art of Persuasion in Greece and Rhetoric in the Roman World; Ancient Literary Criticism*.

³ The tradition originates with Aristotle and his student Theophrastus; see discussion by Kennedy, *Persuasion in Greece*, 270–339; Austin, "Quintilian on

"lucidity," "brilliance," "vividness," and "obscurity" metaphorically, to describe the qualities of good verbal style; Renaissance writers returned these words to their original visual context by using the same critical terms to discuss paintings and sculptures.

Renaissance comparisons of the arts derive primarily from epideictic rhetoric, the oratory of display, which is divided into two categories: praise and blame. Its literary forms are called, respectively, *encomium* and *vituperatio*, or panegyric and invective. Another ancient model for Renaissance apologists derives from forensic rhetoric: the *altercatio* or debate form used to sum up evidence in a case.⁴ Writers did not, however, always adapt these forms directly from ancient models; often medieval transformations intervened, as Leonardo's "paragoni" prominently attest.

The Epideictic Tradition

When Cicero and Quintilian define ideal imitation as the synthesis of many virtues of style, they cite painters and sculptors as exemplary models for literary imitation.⁵ Cicero and Quintilian were well known to fifteenth-century writers, but their discussions of style are always directed to the moral purpose of rhetoric. Two other ancient literary critics—Demetrius of Phaleron, a student of Theophrastus, and Dionysius of Halicarnassus, a Greek writer who lived in Augustan Rome—are of considerable interest to the history of art criticism because they treat style entirely as a matter of literary expression.⁶ Their theories of literary imitation are based on the construction of formal antitheses. Demetrius wrote a critical commentary on Theophrastus' virtues of style, which is in turn derived

Painting and Statuary"; and Pollitt, *The Ancient View of Greek Art*, 32–41, on ancient conceptions of art or *technē*; 60–63, with references to the ancient sources; 296, n. 51 for a citation of one of the earliest examples of speech compared to poetry, painting, and sculpture, by Gorgias in his "Encomium of Helen." On the application of rhetorical criticism to Renaissance art, see the works by Baxandall and Summers (1972, 1977, 1982) in the Consolidated Bibliography.

⁴ According to Kennedy, *Rhetoric in the Roman World*, 507, one of the most interesting chapters in Quintilian's *Institutio oratoria* is Book 6, Chapter 4, on *altercatio* or debate, which ordinarily concluded the presentation of a case, because the technique, as important as it was, was not taught in the schools.

⁵ Quintilian, *Inst. orat.* 12. 10 ff; Cicero, *Brutus*, 70; see Pollitt, *Ancient View of Greek Art*, 81–84.

⁶ For an overview of early humanist issues, see Seigel, *Rhetoric and Philosophy in Renaissance Humanism*. Dionysius discussed imitation as a technique of emulating literary models in terms similar to those of Cicero and the *Rhetorica ad Herrenium*. According to Kennedy, *Roman World*, 363, style became a topic of rhetorical interest for the first time with Dionysius, and classicism and imitation then became the foundation of literary theory. The essential study of the rhetorical tradition with reference to art is still Borinski, *Die Antike in Poetik und Kunsttheorie*; see also Roberts, *Demetrius on Style*.

from Aristotle, and Dionysius developed a similar theory of literary criticism. Among other applications of the formal principle of antithesis or *comparatio*, Dionysius used it to identify autograph qualities of authors, and he taught imitation by experimentally rewriting passages to illustrate the varying effects of composition. These techniques were important models for later ancient writings on art such as the *Imagines* of the Philostrati, which in turn were popular models throughout the Renaissance.⁷ In such descriptions the writer vies with the visual art that is also his subject matter, trying to render pictorial imagery in his own difficult medium of words.⁸

Late Hellenistic and Roman *ekphraseis*, such as the *Imagines*, the *Descriptiones* of Callistratus, and other related forms of literary expression—for example the epigrammatic poetry included in the Greek Anthology and Ovid's *Metamorphoses*—praise the imaginative powers of the artist and the invention of his art in ways that Horace and Simonides may have never intended by the simile *ut pictura poesis*. Whether the pictures to which these descriptions refer are lost or whether they were always only imaginary, these literary exercises reinterpret the ancient comparison of painting and poetry so that literary invention competes directly with visual art.⁹

Renaissance oratory of display leans heavily on this classical context. Panegyrics from the end of the fifteenth century praise Duke Lodovico's court in Milan as a "new Athens" and a "Parnassus," and court poets exalted exceptional men of letters, scientists, and artists in residence, including Leonardo, by comparing them to ancient exemplars.¹⁰ Borrowing commonplaces from Pliny, Cicero,

⁷ For examples, see Gombrich, "The Renaissance Theory of Art and the Rise of Landscape"; Baxandall, "Bartolomaeus Facius on Painting"; and "Guarino, Pisanello and Manuel Chrysoloras," 201–204; Hagstrum, *The Sister Arts*, 57–92, especially 63; Curtius, *European Literature in the Latin Middle Ages*, "The Ideal Landscape," 183–202; Turner, *The Vision of Landscape in Renaissance Italy*, especially 48–49.

⁸ For an important Renaissance application, see the excellent study of S. Alpers, "Ekphrasis and Aesthetic Attitudes in Vasari's *Lives*."

⁹ Lehman-Hartleben, "The *Imagines* of the Elder Philostratus," has presented evidence that the loggia Philostratus described actually existed. For an introduction to the scholarship on the relationship between ancient literature and art, see Blanckenhagen, "The Odyssey Frieze," and Blanckenhagen and Alexander, *The paintings from Boscotrecase*.

¹⁰ Bernardo Bellincioni wrote such a poem: "Athena oggi Milano/ove è il nostro Parnaso Lodovico Le sette arte sian chiamate . . ." (cited by Garin, "La Cultura ai tempi di / Ludovico il Moro," 578). Garin cites this poem, together with Filarete's plan for the ideal city of Sforzinda, in discussing Lodovico's intention to make an Athens out of Milan after his triumph in 1480. Pacioli, *De viribus quantitatis*, an unpublished manuscript (in the Biblioteca Università, Bologna) provides another example. Pacioli compares Leonardo's "ineffable left

Plutarch, Diogenes Laertius, Vitruvius, and others, several of these panegyrics even employ the verb "paragonare" to compare Leonardo to the greatest Greek artists.¹¹

One of the most unusual productions related to this genre is a book dedicated to Leonardo, an anonymous publication entitled *Antiquarie Prospetive Romane, composte per prospettivo milanese dipintor*. This illustrated panegyric is set in "Virgil's Academy," described as a fantastic palace crowned with seven schools in the most beautiful part of Rome.¹² The description is a conventional one typical of medieval courtly allegory—for example, Alain de Lille's description of the palace of "Painting" in the home of "Nature"—and it is also reminiscent of actual celebrations devised at the Sforza Court.¹³ The unidentified author, in fact, quotes part of a poem by Lodovico Sforza's Chancellor Baldassare Taccone composed for a court celebration and probably commemorating Leonardo's colossal modello for the equestrian portrait of Francesco Sforza.¹⁴ In an exemplary comparison derived from Vitruvius or Cicero, the Milanese *prospettivo* praises Leonardo as a good sculptor, painter, and geometer, and compares him favorably to Phidias, Myron, Scopas, and Praxiteles for the beauty of his

hand," which produced the achievements of Apelles, Myron, and Polycleitos (cited in Pacioli, *De Divina Proportione* [Milan, 1956], 226). Greek studies were particularly strong at Milan, as they were in Naples, where similar exemplary comparisons were made: see Baxandall, "A Dialogue on Art." On the Virgilian formula of the Golden Age, utilized most of all by the de' Medici, beginning with Lorenzo the Magnificent, see Gombrich, "Renaissance and Golden Age"; and Cox-Rearick, *Dynasty and Destiny in Medici Art*.

¹¹ For encomia addressed to artists, see Colasanti, "Gli artisti nella poesia del Rinascimento." Some poems were mock-vituperatios, teasing invectives that must have been part of the court entertainment. For example, the poems composed by Bramante are generally believed to be parodies (Forster, *Bramante*, 282).

¹² A modern edition is found in Govi, "Intorno a un opuscolo rarissimo." Since Govi, numerous attempts have been made to attribute this publication to Bramante; see Pedretti, *Leonardo Architect*, 116 ff.; and Fienga, "The Antiquaire prospetive romane composte per Prospettivo Melanese Depictore," 31–52, both of whom support the attribution to Bramante.

¹³ The description of "Virgil's Academy" as a sacred building ornamented with precious stones and jewels and including "seven schools," presumably of the liberal arts, is an updated version of a common motif in prose romances and allegories such as the widely known *Anticlaudian* of Alain de Lille. An excellent example of a medieval imitation of Ovid's palace of Apollo is cited by Neilson, *The Origin and Sources of the Court of Love*, 136–137, and many prose romances include descriptions of palaces in the same tradition; see further examples in Crane, *Italian Social Customs of the Sixteenth Century*, 54–97.

¹⁴ See Agghàzy, "Leonardo da Vinci, Francesco I, e il bronzo equestre," 95, citing Taccone's poem. Taccone composed the mythological story of *Danae*, a play presented in 1496 for which Leonardo designed the scenic apparatus; sketches are preserved on a sheet in the Metropolitan Museum of Art; see Pedretti, *Leonardo Architect*, 290.

sculpture: “se con lui *al paragon* soffronta / Fidia: Mirone: Scopa e Praxitello / diran ch’al mondo mai fusse el più bello.”¹⁵

Another formal parallel to Leonardo’s praise of painting as a liberal art is Bernardo Bellincioni’s *Ripresentazione*, published in 1493, performed in Pavia at the doctorate of “Monsignore della Torre,” perhaps even the anatomist Marcantonio della Torre with whom Leonardo was later associated. This pageant recalls the imagery used by the anonymous Milanese painter in its versified panegyrics presented by personifications of the liberal arts.¹⁶ Bellincioni and Leonardo collaborated on another *spettacolo*, the *Festa del Paradiso* presented at the Castello Sforzesco for the wedding of Gian Galeazzo Sforza and Isabella of Aragon in 1490.¹⁷ For this production Leonardo devised theatrical architecture decorated with painted compartments of antique *istorie*, recorded by an eyewitness in a manuscript now in Modena.¹⁸ Reminiscent of galleries of art described in prose romances such as Boccaccio’s *Amorosa Visione*, Giovanni del Prato’s *Paradiso degli Alberti*, or Francesco Colonna’s *Hypnerotomachia Poliphili*, this description records an event that links the literary topos of a picture gallery with a visual tradition—an important connection, as we shall see. Traditional praise for the liberality of a ruler could, of course, take purely literary form and still invoke the visual arts; one might recall Leon Battista Alberti’s *De pictura*, dedicated to Gianfrancesco Gonzaga, “the Prince of Mantua,” for his love of the “liberal arts.”¹⁹

The Ancient Agon and Medieval Poetic Contests

The Ancient Greek dramatic debate or poetic contest called an *agon* (Latin *certamen*) is a prototype *Paragone*. The *agon* is associated with public festivals, such as the dramatic competitions in honor of Dionysius held at Athens. The motif of a contest between poets or

¹⁵ The author also praises Leonardo as a good geometer. As Govi, *Un opuscolo rarissimi* notes, the same poem was borrowed a few years later by Luca Pacioli, who praised Leonardo with many of the same epithets in his treatise “De viribus quantitatis” (see n. 10). The Ciceronian formula was used in the early seventeenth century by Gerolamo Teti; see n. 77.

¹⁶ Cited in Garin, “La cultura ai tempi du Ludovico il More,” 575–576; discussed by Doglio, “Spettacoli a Milano,” in *Leonardo egli spettacoli del suo tempo*, 39.

¹⁷ See discussion in Kemp, *Leonardo da Vinci*, 167–168; Winternitz, *Leonardo as a Musician*, 75–77; Doglio, “Leonardo ‘apparatore’ di spettacoli,” in *Leonardo egli spettacoli*, 41–49; and Pedretti, *Leonardo Architect*, 290, with further references.

¹⁸ The manuscript in the Biblioteca Estense di Modena (*cod. It. n.521*, a I 4, 21) was first cited by Solmi, *La festa del Paradiso*, 75, and is discussed by Brizio, “Bramante e Leonardo,” 22; and Steinitz, *Leonardo architetto teatrale*, 256.

¹⁹ Alberti, *On Painting and On Sculpture*, 34–35.

seers is very old and widespread in Greek literature; the archetypal poetic contest is the *agon* between Homer and Hesiod, first recorded in a fragment from a work of the third century B.C., the *Museum* of the sophist Alcidamas, and also mentioned by Aristophanes, Plutarch, Philostratus, and Varro.²⁰ *Certamina* were also popular in Rome after their introduction in 186 B.C.²¹

The ancient origins of the poetic debate were known to the Renaissance through a variety of classical sources. Yet, even though Renaissance writings are modeled on classical rhetorical forms, there is little evidence to suggest that Renaissance authors of debates on the visual arts directly emulated ancient poetic contests.²² More significant for Leonardo's arguments are the medieval poetic contests variously called *certamen*, *conflictus*, and *altercatio*.²³ From this tradition, Leonardo acquired particular tropes and patterns of justification.

These poetic debates, which appear as early as the eighth century, continue the ancient tradition of the *agon* in a greatly altered form. The mixed heritage is discernible in Leonardo's *Parte Prima* arguments, where medieval borrowings exist alongside occasional references to ancient works. Leonardo incorporated *topoi* well known in medieval poetic strifes, such as the relative nobility of the external senses, expressed in such traditional formulations as

²⁰ West, "The Contest of Homer and Hesiod," discusses problems of attribution and dating presented by the physical evidence with references to earlier literature. The text is known in two variants, a papyrus fragment in the Museum of the University of Michigan and a fifteenth-century copy of an Antonine manuscript in Florence that was published by Henri Estienne, *Homer et Hesiod certamen*, 1573. The circulation of this manuscript in the fifteenth century has not been discussed in the scholarship. On the tradition, see Hess, *Der Agon zwischen Homer und Hesiod*. The supposed contest held at Chalcia between Homer as the poet of war and Hesiod as the poet of peace was perhaps inspired by Hesiod, *Opera*, 650–660.

²¹ According to the entry for "agones" in *The Oxford Classical Dictionary*, Greek public festivals with competitions for prizes began at Athens as dramatic competitions in honor of Dionysius. In Rome they were popular from their introduction in 186 B.C. until the end of the Republic and later; Aurelian instituted the *Agon solis* in 274 A.D.

²² It would take a separate study to investigate references to ancient poetic contests in Renaissance literature; allusions do not seem to occur in the literature on art. Moreover, despite the similarity of the words *agon* and *paragone*, there does not seem to be any ancient etymological connection; since *paragone* is first recorded in medieval Greek and probably derives from *parago* through an intermediate Latin noun form. The etymology is discussed in Chapter One.

²³ The first historian to connect Leonardo's *Parte Prima* passages with medieval poetic debates was Jordan, *Untersuchungen über das Malerbuch*, Chapter 1, "Der Paragone."

“which is the more damaging blow, to lose sight or hearing?”²⁴ In one case (*Parte Prima*, Chapter 36), Leonardo echoed medieval personified allegories in transforming an ancient source—Lucian’s autobiographical satire, *The Dream*—to argue that painting was a liberal art whereas sculpture was mechanical labor.

The question and answer form we associate with scholastic disputation is pervasive in medieval culture. Most generally, Leonardo’s medieval precedents are in the tradition of neoplatonic love poetry, chivalric literature such as the treatise of Andreas Capellanus, *De amore libri tres*, composed around the end of the twelfth century.²⁵ This literary genre derives from classical eclogues, and is particularly indebted to Ovid’s *Ars amatoria*, which is in turn a parody of technical arts treatises.²⁶ Capellanus, clearly writing in the tradition of Ovid, includes a systematic treatment of conventional questions or *dubbi* of love. In this tradition, dialogues on matters of proper amatory conduct were also incorporated into prose romances or recited as mock poetic “debates” to entertain an aristocratic audience.²⁷ The literary form was still popular in the

²⁴ See *Parte Prima* Chapters 15, 16, 20, and 23 for the most direct evidence of these medieval roots. For comparative examples, see Steinschneider, “Rangstreit-Literatur,” nn. 4, 34, 59b, and 71 b and c. Another overview of the literary tradition, emphasizing its neoplatonic roots, is available in Neilson, *The Origin and Sources of the Court of Love*. According to Neilson, 240, the *débat* as a literary form appears very early in medieval literature; he cites the Latin *conflictus*, *Venus et Hiemis*, from the time of Alcuin. On the origins of the debate form in ancient eclogues, see Jeanroy, *Les Origines de la Poésie lyrique en France*. Dramatic recitations are an important aspect of the tradition, studied by d’Ancona, *Origini teatro in Italia*, vol. 1; see 547–563 on the “contrasto.” Poetic debates known as *jocx partitz* took the form of a competition between poets with an appeal to ladies. Such song-contests are thought to have been a chief amusement of courtly society, and literary versions were also incorporated into prose romances, often together with appreciations for works of art as in Boccaccio’s *Amorosa visione*, Giovanni del Prato’s *Paradiso degli Alberti*, and Pietro Bembo’s *Asolani*. Francesco Colonna’s *Hypnerotomachia Poliphili*, composed in 1469 and published in Venice in 1499, is a noteworthy example, exactly contemporary with Leonardo’s Sforza period, of the continuing fashionability of the genre. Slightly later is Francesco Lancillotti’s versified *Trattato di Pittura* (Rome, 1509), which has been cited as an early comparison of the arts because it includes a complaint that painting is not among the liberal arts (I. Richter, *Paragone*, 15); see Crane, *Italian Social Customs*, 13–155. As Crane, 107–108, notes with reference to Castiglione’s *Il Cortegiano*, throughout the sixteenth century brief treatises in this genre were embedded in other works.

²⁵ See Parry, Introduction to Capellanus, *The Art of Courtly Love*.

²⁶ Ovid, *The Art of Love and Other Poems*. For an overview of the courtly tradition of love, see Nelson, *Renaissance Theory of Love*. See also Neilson, *Court of Love*, 170–180, on the Ovidian tradition and Moorish and Spanish elements of the Provençal literature.

²⁷ In a broad sense, literary debates on love like Guillaume’s *Roman de la Rose* belong to the same tradition as allegories of nature; see Curtius, *European Literature*, 40 ff.

later sixteenth century, when a number of anthologies of *dubbi*, also called "paradoxes," appeared in print.²⁸

Questions resembling Leonardo's arguments in defense of painting are also found as early as the eleventh century in poetic debates called *tenzoni* or *contrastì*, based on Provençal and Arabic models.²⁹ Secular *tenzoni* like the debate between *Anima* and *Corpo* sometimes echo, or even parody, abstract theological literature. They belong to the widespread genre of Psychomachia, battles between personified virtues and vices, a genre for which there exist both literary and visual traditions.³⁰ One of Leonardo's more striking derivations from *tenzoni* personifies all the senses: "the other senses compete in wanting to battle with the eye. It appears the mouth would like to swallow this being bodily, it seems the ear takes pleasure in hearing about its beauties, the sense of touch would like to penetrate through all its pores, and the nose would like to inhale the air that this being continuously breathes."³¹

²⁸ These late examples of the genre include Ortensio Lando's collection of paradoxes of love published in 1543, Antonio Ridolfi's *Artefila* of 1557, and Giovanni Manso's *I Paradossi overo dell'Amore* of 1608, which has been characterized as the "most extensive treatise on love in any language" by Crane, *Italian Social Customs*, 150; see 107–158 for a history of the printed literature. Further information can be found in Cropper, "On Beautiful Women," with a valuable discussion in connection with Renaissance art. Texts are available in *Trattati del cinquecento sulla donna*. While the present study does not include a consideration of the visual tradition, it is worth mentioning that chivalric themes were popular in fifteenth-century humanist circles, as Pisanello's recently rediscovered frescoes based on the romance of Lancelot testify: see Woods-Marsden, "Pictorial Style and Ideology," and now, *The Gonzaga of Mantua and Pisanello's Arthurian Frescoes*.

²⁹ One specifically Italian form consisting of a sonnet pair, a *proposta* and a *risposta*, seems to have developed from such mock epideictic types, according to Crane, *Italian Social Customs*, 20. The dissemination of *tenzoni* to Italy and throughout Europe is credited to traveling troubadours; see A. Klein, *Die altfranzösischen minnefragen*.

³⁰ Examples of *tenzoni* on abstract questions are abundant; see d'Ancona, *Origini teatro* and Steinschneider, *Rangstreit* (whose catalogue includes a number of Arabic and Hebrew examples), nn. 13, 14, 43, 62, 104, 105, 108b, 110, 117. Doglio, "Spettacoli a Milano," 20–21, cites popular festivals on the sacred grounds of the Milan Cathedral that treated religious subjects in burlesque terms. On the transmission of ancient didactic personified allegories in the tradition of Prudentius' "Psychomachia" and Boethius' *Consolation of Philosophy*, see Stahl, Introduction to *Martianus Capella and the Seven Liberal Arts* 1: 1–7, 1–72, and for an extensive bibliography to studies of the visual tradition, *Appendix A*, 2: 245–249.

³¹ *Parte Prima*, Chapter 23. Less directly related, but similar in its sophistic reasoning and general tenor of parody, is a claim he makes in chapter 25: "Others have painted lustful acts, and so much lewdness that the paintings have incited beholders to the same celebration. This, poetry will not do." Other, related references to contests in Leonardo's arguments incorporate anecdotes in the ancient tradition discussed by Kris and Kurz, *Legend, Myth, and Magic*. Many medieval *tenzoni* contain long pictorial descriptions, often presented in a context of judgment (as to which is the most pleasing or delightful). I owe to Patricia Harris Stablein the suggestion that extended descriptions of colors (as in the

Rivalry of the Arts at the Sforza Court

Fictionalized dialogues on the virtues of love were typically set before a judging audience in a courtly environment—hence the term “Court of Love.” While most scholars now feel that these courts are a literary fiction (on the order of Ovid’s imaginary temple of Apollo, or “Virgil’s Academy”), the literature probably does reflect improvisatory forms of aristocratic entertainment.³² In reading Leonardo’s polemical defense of painting, then, one should imagine the courtly audience for which it may have been originally composed. Poetic contests, like other forms of rhetorical display, were part of the pageantry associated with the Court of Milan and other similar aristocracies. In a carnival held in 1423 to celebrate the entry of the Sforza, dramatic eclogues on love were recited in competitions that lasted for a week.³³ Baldassare Castiglione, in *Il Libro del Cortegiano*, staged a polite debate on the supremacy of painting and sculpture among members of Duke Guidobaldo’s court in Urbino. In Book One, they argue about differences in ornamentation that distinguish the vice of affectation from the virtue of an ideal demeanor cultivated with feigned nonchalance, a manner of graceful comportment for which Castiglione coins the word *sprezzatura*.³⁴ Castiglione’s dialogue, which is directed to the nature of nobility, not only recalls medieval *dubbi*, but also nearly duplicates several of Leonardo’s arguments in the *Parte Prima*.³⁵ The resemblances suggest how a light improvisation at a *spettacolo*

“Dispute of Flora and Phyllis” which occurs in the *Carmina Burana* and elsewhere) might be significant precedents to Leonardo’s discussions of the “aesthetic” merits of painting: see Paden, Sankovitch, Stablein, eds., *The Poems of the Troubadour Bertran de Born*, 44 ff., for discussion of poetic pictorial imagery imitated by artists. For discussion of rhetorical devices used by medieval writers and also by Leonardo, see the Commentary Notes to the comparisons of painting and poetry. Finally, it is worth mentioning that some of Leonardo’s arguments (such as *Parte Prima*, Chapter 37) contain wordplays that also have general precedents in troubadour poetry, for which see Paterson, *Troubadours and Eloquence*; and Kendrick, *The Game of Love, Troubadour Wordplay*.

³² Neilson, *Court of Love*, reviews the scholarship (summary at 248–256).

³³ Cited by Neilson, *Court of Love*, 254–255, with references. According to Vasari, Leonardo was famed as an improviser of verse, as well as being so skilled a musician that Duke Lodovico invited him to the Milanese Court for this reason; Winternitz, *Leonardo da Vinci as a Musician*, xxii–xxiv, discusses the Renaissance literary evidence for Leonardo’s originality as a musician and an inventor of musical instruments.

³⁴ For the comparison of painting and sculpture, see Castiglione, *Il Libro del Cortegiano*, I, chapters 49–53.

³⁵ On Castiglione and the *Parte Prima*, see CNs 16 and 27; see CN 45 for later arguments Castiglione does not include. Castiglione arrived at the Sforza court in 1496; his book, begun in 1508 and set at the court of Urbino, was intended to record the memory of a better life under former regimes, and so it is easily conceivable that he utilized memories from his days in Milan. On the history of

might have been the origin of some of Leonardo's finest arguments for the supremacy of painting, such as two passages preserved in *Ms. A (Parte Prima, Chapters 19 and 38)*, composed around 1492.

It is also possible that there was a real-life source for Leonardo's anecdote in the *Parte Prima* about a defense of painting against poetry, judged by the esteemed collector King Matthias Corvinus of Hungary. We know that King Matthias and Leonardo never met, although Matthias had close ties with the Milanese Court and commissioned a painting from Leonardo in 1485.³⁶ And there are many medieval examples of this sort of anecdote, so Leonardo's tale may well be fictive. But it might also have embroidered actual circumstances to praise the humanist king and ally of the Milanese.³⁷

Leonardo's witty, tendentious defense of painting suggests that the poetic strife survived as a literary structure largely because it encouraged new permutations on a familiar model. But we should not overestimate the importance of formal sources. Many of Leonardo's sources are not polemical at all. Beyond the rhetorical forms he employed, the competitive flavor of the *Parte Prima* is his own literary invention, accentuated by his compilers, supported by a

the manuscripts, see Bonora, Introduction, Castiglione, *Il Libro del Cortegiano*, 6–13.

³⁶ King Matthias never went to Italy, but members of Lodovico's court went to the Hungarian court; see the extensive documentation in *Matthias Corvinus und die Renaissance in Ungarn*, especially 81–89, 104–106. See further discussion at CN 27. Heydenreich, *Leonardo da Vinci*, 2: 179–184, lists Leonardo's paintings and studies according to the status of their attribution and documentation, with references. The Madonna commissioned by Matthias, n. 37 on Heydenreich's list, is mentioned in a contemporary letter, but it is not known whether the painting was ever executed. The anecdote about Matthias judging works of painter and poet brings to mind an actual disputation reported by Luca Pacioli, a scientific duel between theologians, scientists, engineers, inventors, and artists including Leonardo that took place at the Sforza court in Lodovico's presence, in 1498. See references at CN 9. Unfortunately, all we know about this event is Pacioli's report, although the incident has contributed to speculations about the existence of Leonardo's so-called Academy, an issue abandoned by recent scholars; see Pevsner, *Academies of Art Past and Present*, 25–33. Garin, "La cultura ai tempi," 554–559, discusses the context of court polemics as a form of entertainment.

³⁷ For examples of this topos, see Cutler, "Misapprehensions and Misgivings: Byzantine Art and the West." M. Kemp, "The Exercise of Fantasia," in *Leonardo da Vinci*, 152–212, provides a concise account of Leonardo's activities and contacts at the Sforza court. The most extensive history of the Sforza court available at present is limited to the duchy of Lodovico's predecessor: see Lubkin, "The Court of Galeazzo Maria Sforza," with references to earlier studies of Milanese court culture. More recently, see *Gli Sforza a Milano*; Cataloni, *Gli Sforza tra la Francia e Machiavelli*; *Leonardo a Milano, commune di Milano*. (For these references I thank Connie Moffatt, who is currently completing a dissertation at the University of California at Los Angeles on Duke Lodovico's country retreat at Vigevano.) See also Schelle, *Die Sforza*, 153–156; Rondinini, *Saggi di Storia e Storiografia*; and Norris, *The Sforza Court*.

long tradition of artistic competition, and probably impelled by the courtly setting that seems to have been the first occasion for his defense of painting. For instance, on the basis of his studies of optics and mathematics, Leonardo distinguishes between the physical and mathematical components of perspective, and from the terms of difference constructs a polemic against sculpture (*Parte Prima*, Chapter 45). Similarly, he distinguishes between mathematical and physical harmony to construct a polemic against music (*Parte Prima*, Chapter 32). And he turns a comparison of painting and sculpture in Alberti's *della Pittura*, originally an expository argument, into yet another polemic (*Parte Prima*, Chapter 39).

Certainly the exchange of repartee was an important source of entertainment at the Sforza court, where scholarly invective sometimes became serious enough to elicit Duke Lodovico's intervention.³⁸ Leonardo's own polemics were consistent with the court's high esteem for Aristotelian science and perhaps satirized humanist rivalries, since they were often mock epideictics similar to parodies composed by less intellectually pretentious members, like the poets Bellincioni and Gaspare Visconti.³⁹

Leonardo was especially sensitive to challenges presented by vernacular poetry and by music, areas in which he also made his own contributions. Early accounts cite his accomplishments as a poet and a musician who could improvise beautifully on the *lira da braccio*, an early form of the violin.⁴⁰ One source, the anonymous *Codex Magliabecchiano*, claims that he was originally sent to Milan by Lorenzo de' Medici himself to present the Sforza duke with this

³⁸ Merula, who also exchanged manuscripts with Poliziano, was the center of attention when he joined the court in 1482. He was evidently the subject of invectives before and after his arrival in Milan, judging by Gabriele Paveri Fontana's *Georgium Merlanum Merulam Merlanica prima*, Milan, 1481, and other contributions, by Galeotto Marzio and Giovanni Biffi; see Malaguzzi-Valeri, *La Corte di Ludovico*, 115–118; on the specialists employed by the Sforza court, see Lubkin, "The Court of Galeazzo Maria Sforza," 212–248. One can imagine that, in addition to entertaining the Sforza with his acidic wit, Merula helped honor Aristotelians like Ermolao Barbaro while he was the Venetian ambassador to Milan, and Bernardino de Treviso, a Venetian Franciscan who dedicated his commentary on the *Meteorologica* to Il Moro. These and other Aristotelians are also cited by Malaguzzi-Valeri, *La Corte di Ludovico*, 119.

³⁹ M. Kemp, "Science and the Poetic Impulse," 199, identified Leonardo as the subject of one such invective, by Visconti, which attacks a painter who "when it comes to making a good poem / and to make paintings which work well as a whole, / he lacks the fetters, restraints and chains."

⁴⁰ Vasari, *Vite*, ed. Bettarini and Barocchi, praises Leonardo's ability as a youth to improvise "divinamente" on the *lira* (4: 16), and claims that Leonardo played for Duke Lodovico to console him on the sad occasion of Galeazzo Sforza's death in 1494 (4: 24). Winternitz, *Leonardo da Vinci as Musician*, xxii–xxiv, brings together all the early testimony; Winternitz, 7, establishes that Leonardo played the *lira da braccio*.

same instrument.⁴¹ In connection with court festivals, Leonardo may have met the music theorist Franchino Gaffurio, appointed choirmaster of the Milan cathedral in 1484, who in the 1490s was writing books on the theory and practice of music.⁴² Current developments in musical harmony are certainly a key to the origins of Leonardo's arguments involving music. Although it is not recorded whether they ever collaborated musically, Gaffurio and Leonardo, along with the architects Donato Bramante (who also had a keen interest in music) and Francesco di Giorgio, were involved in the competition to design a new lantern tower for Milan cathedral in 1490.⁴³ Leonardo's knowledge of Gaffurio's theories may explain why his discussions of painting in terms of polyphonic harmony as early as 1492 are similar to arguments recorded a few years later by Luca Pacioli, who arrived in Milan only in 1496.⁴⁴

⁴¹ *Il Codice Gaddiano*, 52. This is the *Codex Magliabecchiano* owned by Antonio Billi and written between 1506 and 1532, which also records that Leonardo was "raro sonatore di lira," and the master of Atalante Migliorotti, a young musician who accompanied him to Milan. Winternitz, *Leonardo da Vinci as a Musician*, 22, gives a biography of the shadowy figure Migliorotti. When Irma Richter, *Paragone*, 7-9, briefly sketched Leonardo's contacts with musicians at court, she claimed that Atalante became an acclaimed maker of musical instruments. Paolo Giovio, another early source, also praised the elegance and delight of Leonardo's theatrical inventions: *De viris illustribus*, ca. 1527, reproduced in Richter, *The Literary Works*, 1: 2-3; and see the discussion in Doglio, "Spettacoli in Milano nel periodo Sforzesco," in *Leonardo e gli spettacoli del suo tempo*, Milan 1983, 48. Doglio, 39, also cites the comment of the historian Bernardino Corio (*Patria Historia*, Milan, 1503), that the splendid court included famous painters assembled from distant lands, and the sweetest kinds of songs and music. Winternitz, *Leonardo as a Musician*, 73-74 and 76-83, describes 10 major *spettacoli* produced during Leonardo's residency and discusses the evidence for his varied contributions to them.

⁴² Onians, *Bearers of Meaning*, 219 ff., has discussed extensive correlations among the writings of Gaffurio, Francesco Colonna, Pacioli, Leonardo, Bramante, Francesco di Giorgio, and Cesariano, revolving around harmony in music, perspective, and architecture. However, despite claims to the contrary by Winternitz, *Leonardo da Vinci as a Musician*, there is no documentation that Gaffurio and Leonardo ever met or exchanged ideas. On Leonardo's sources, see also the discussion of his appreciation for Alberti's prescriptions for figurative *varietà* in *della Pittura*, in CN 19. Recently, the unfinished portrait of a musician, now in the Ambrosiana Museum, Milan, which is sometimes attributed to Leonardo and definitely closely associated with him, has been identified on the basis of the sheet music held by the sitter as the Flemish composer Josquin des Pres, another key figure among Leonardo's possible musical acquaintances (on Josquin, see Lopez, et al., *gli Sforza a Milano*, 146, citing Clercx-Lejeune, "Fortuna Josquini").

⁴³ According to Vasari, *Vite*, ed. Milanesi, 4: 164, music was one of Bramante's main interests. Pacioli and Leonardo's contribution to the competition in Milan are discussed later in this chapter. On the *tiburio* of Milan cathedral, see Pedretti, *Leonardo Architect*, 32-50; on Bramante and Gaffurio, see Onians, *Bearers of Meaning*, 223, 229.

⁴⁴ "Vertical" harmonic composition was introduced in the mid-fifteenth century and first described technically by Tinctoris, according to Bonnie Blackburn ("On Compositional Principles," 211). Gaffurio simplified the mathematical

New ideas about harmonic proportion and musical invention associated with the Sforza court are evident in Leonardo's conception of concord, *concento*, or "divine harmony," as common to both music and painting.⁴⁵ As the Commentary Notes on music elaborate, these ideas are based in a Vitruvian tradition for identifying geometric proportions with the harmonic proportions of music, an analogy that Alberti had recently elaborated in his treatise on architecture (which Leonardo owned). But Leonardo's distinctive vocabulary also suggests that direct conversations with Pacioli and Milanese musicians (possibly Gaffurio) contributed to his formulations.⁴⁶

Leonardo's paintings also bear comparison with vernacular poetry ranging from his own literary products to other poetry composed at the Milanese court. His procedures as well as his subject matter are analogous to contemporary literary practices, and his familiarity with imaginative literature is corroborated by his library, which included volumes by his associates, such as Luigi and Luca Pulci, Domenico Burdiello, and Gaspare Visconti; classics in Italian translation, including Livy, Aesop's fables, and Ovid's *Metamorphoses*; and reference books like Cecco d'Ascoli's encyclopedic *L'Acerba*, long recognized as one of the most important sources of his emblematic imagery.⁴⁷ According to Martin Kemp,

ratios of Pythagorean proportions for the sake of composing harmonies pleasing to the ear (Miller, Introduction, Gaffurius, *De Harmonia Musicorum*, 22); and he defined music as the "arrangement of proportionally disjunct sounds in pleasing intervals, making a consonance of sense and reason" (*De Harmonia Musicorum*, Book 1, chapter 1, *ed. cit.*, p. 35). Like Leonardo, he also compared painting with music on this basis, that its harmonic proportion is ordered to sense perception (Book 4, chapter 16, *ed. cit.*, p. 204). However, while it is generally agreed that Gaffurio developed the new concept of simultaneous (as opposed to successive) polyphony, the extent to which he favored tempering the resulting tonal consequences to please the ear is an open question (compare *Grove Dictionary of Music* 7: 78). Even though this practice had ancient theoretical precedents in Ptolemy, Gaffurio disagreed bitterly with his Bolognese rival Bartolomeo Ramos's new ideas on tuning (see Palisca, *Humanism in Italian Renaissance Musical Thought*, 212 ff. I am grateful to Camille Ibbotson, to whom I owe this reference to Ramos, for discussing the issues with me. See further discussion in the Commentary Notes on music.

⁴⁵ For the arguments on harmony, later included in the *Parte Prima*, see the Commentary Notes on music and CN 25. Leonardo, who met Francesco di Giorgio around 1490, in Pavia or Milan, owned the manuscript by 1503–1504, when he listed the contents of his library in the *Madrid Codex II* (Reti, *Madrid Codices*, 3: 105, n. 99), but he may have acquired it only after Francesco's death in 1502, according to Pedretti, *Leonardo Architect*, 196. Ideas shared by Pacioli, Francesco, and Leonardo are discussed at the end of this chapter.

⁴⁶ See the introduction to the Commentary notes on music.

⁴⁷ Sources recorded in his booklists, especially CA 210 r–a, R. 1469, ca. 1490–1492; CA 104 r–a, ca. 1495–1497 (see Pedretti, *Commentary*, 2: 353–354, and Richter's notes at R. 1469); and *Madrid Codex II* (on these two lists, see Reti,

Leonardo's experimentation with various genres ranging from pictograms and visual emblems to portraiture and elaborate descriptions of nature actively challenged the values of *dolce stil nuovo* poetry practiced at the Milanese court.⁴⁸ Kemp has argued that portraits from Leonardo's Milanese period, like the painting of Lodovico's mistress Cecilia Gallerani (Figure 4), and even later commissions like the *Mona Lisa*, bear close correspondences to the stereotypes of Petrarchan love sonnets.⁴⁹ The resemblances extend beyond the narrative qualities of shared subject matter to structural analogies: for example, the technique of light-dark contrast that underlies Leonardo's painted reliefs is frequently used in Petrarchan imagery.⁵⁰

When Leonardo challenged poets to surpass painting by composing better portraits, battlepieces, *istorie*, and landscapes, he applied criteria that also made painters compete with poets on their own terms. He borrowed ancient analogies between painting and writing—most often in conventional associations between verbal craftsmanship and the artist's processes—that humanists like Gasparino Barzizza and Guarino of Verona had revived earlier in the fifteenth century.⁵¹ These analogies mutually reinforced one another, in part because vernacular poetry, like the scientific artistic procedures that Leonardo defended, was rooted in Aristotelian natural philosophy.⁵² Leonardo's detailed analysis of marble carving in Chapter 37, for example, takes the form of a popular rhetorical device known as *descriptio* in which the maker of an artifact is described at work. This verbal description can begin to suggest the symbiotic relationship between Leonardo's literary, scientific, and artistic practices. Medieval and Renaissance descriptions of artistic procedures were often metaphors for various kinds of mental discourse such as poetic invention, even scientific

ed., *The Madrid Codices*, 3: 92–109, nn. 6, 7, 8, 12, 20, 35, 40, 41, 61, 64, 70, 73, and 90). On parallels between Leonardo's visual art and established literary genres, see further discussion in the Commentary Notes to poetry.

⁴⁸ Most recently studied by M. Kemp, *Leonardo da Vinci*, 152–212, and "Science and the Poetic Impulse."

⁴⁹ M. Kemp, "Science and the Poetic Impulse," 199, and *Leonardo da Vinci*, 248 ff.

⁵⁰ As in the example Kemp, "Poetic Impulse," 200, cites by Visconti (*Canzoniere*, XI, [8]): "The wise merchant who wishes to sell / A beautiful white pearl of the Orient, / Contrives to show it in a black sandal."

⁵¹ Baxandall, "Guarino, Pisanello and Manuel Chrysoloras," and *Giotto and the Orators*, 4 ff.

⁵² M. Kemp, "Science and the Poetic Impulse," and Gombrich, "Leonardo's Method of Working out Compositions," have in particular called attention to the reciprocal relationship between poetic invention, or *fantasia*, and *scientia* in Leonardo's practices.



Ill. 4. Attributed to Leonardo da Vinci. *Portrait of a Lady with an Ermine (Cecilia Galleriani)*. c. 1485. Cracow, Czartoryski Museum.

induction. Leonardo's description may indeed have been perceived by his original courtly audience as an allegory of the life of the mind.⁵³ *Evidentia*, the ancient equivalent of the figure *descriptio*, is described by Quintilian in his discussion of *enargeia*, where he makes analogies to painting and sculpted relief to suggest how a nondiscursive verbal image heightens a representation in words.⁵⁴ Figured language persuades the listener by exaggerating the clarity of an event through the pictorial descriptions of certain details that inscribe a memorable image upon the listener's imagination. Humanists like Guarino provided an immediate precedent for Leonardo's defense of painting against verbal description with claims that ekphrastic descriptions in which words could portray sounds and speech, brought more vivid images to mind than images "presented by means of the brush."⁵⁵

Practice of the "Rival" Arts

In one sense, then, Leonardo merely turned existing interart analogies around by returning metaphors of painting to their original visual context; but in another sense, the historical use of

⁵³ Compare, for example, how George Chapman's narrator in *Hero and Leander* (I.42) explains that working the embroidery of a scarf is a learning process for the maker in which the bifurcated halves of the fabric "figur'd the division of her minde" (cited by Hazard, "The Anatomy of 'Liveliness,'" 416, in her discussion of *enargeia*). Hazard, who cites (p. 410) Leonardo's drawings and writings in her discussion of Renaissance meanings of "liveliness," coins the term "iconic description" for this specific type of figure. Medieval examples of the same device are discussed in the introduction to the Commentary Notes on sculpture.

⁵⁴ *Evidentia* is a method of amplification through description that results in vivid illumination, or *enargeia*, as described by Quintilian, who makes an analogy to visual experience (*Inst. orat.*, 8.3.5). Quintilian also criticized overabundance of ornament by comparing it to painted relief, when he discussed the figure of reflexion, or antithesis of thoughts, which is like a picture in which "definite outline is required to throw objects into relief, and consequently artists who include a number of objects in the same design separate them by intervals sufficient to prevent one casting a shadow on the other" (8.5.26). According to Quintilian, *enargeia* is to be understood as a virtue of ornate style, the most embellished and difficult of three types (12.3.61 ff). Vivid illumination enjoyed a revival in medieval poetics. Twelfth-century *ars poetica* treatises like Geofrei of Vinsauf's *Poetria Nova*, ca. 1210 (which replaced the former distinction between three kinds of style with two kinds of embellishment), emphasize the plastic nature of images, based on a conception of poetry that is primarily descriptive and pictorial in its expressiveness (de Bruyne, *Études d'esthétique médiévale*, 2: 223 ff.; on Geofrei's discussion of *descriptio*, and related metaphorical constructions that create brilliant or vivid imagery, see Murphy, *Three Rhetorical Arts Treatises*, 52 ff.). *Enargeia* has been studied as a Renaissance virtue of style by Tuve, *Elizabethan and Metaphysical Imagery*, 114 ff.

⁵⁵ In a letter to Iohannis Quirinus, 1416(?), describing the usefulness of Pausanias' *Description of Greece*, cited by Baxandall, "Guarino, Pisanello and Chrysoloras," 185–186.

descriptio to construct naturalistic allegories adds a measure of indeterminacy to Leonardo's entire discussion of painting and sculpture. Overtly, his defense of painting is a retort to humanistic panegyrics in praise of letters. But the question is raised whether Leonardo's polemics were also intended and understood as allegories—that is, disguised descriptions of mental processes. The notion of painting and sculpture as practical demonstration or proof, endemic to Renaissance art, is related to this conception and, indeed, it could be said of Leonardo that he spent his career demonstrating that painting is a liberal art requiring rational thought.⁵⁶

In fact, the drawing, model, or “demonstration piece,” used both for the artist's private purposes and in juried competitions, is an important element of the context out of which the *Paragone* grew. Like many other Renaissance artists, Leonardo developed numerous pictorial techniques to manipulate plastic form through sketches, stereometric drawings that record multiple views, and actual models like wax maquettes; and in his notes he also recorded empirical demonstrations, real and imaginary, that could be used to test scientific theories.⁵⁷ Ancient sources like Pliny, whose anecdotes were often modernized in Renaissance retellings, further encouraged the practice of construing painting in terms of proofs, trials, and contests. Famous demonstrations like the one between Apelles and Protogenes as to which painter could render the “*linea summae tenuitatis*” (a story that Lorenzo Ghiberti for one transformed into a demonstration about a difficult problem of perspective) must have been popular partly because they depict the artist as *aemulus*,

⁵⁶ Gombrich, “Renaissance Conceptions of Artistic Progress,” 7–8, sketched Leonardo as an artist who works like a scientist producing demonstrations (like the cartoons for the *Virgin and Child with St. Anne*) which define solutions to problems. Renaissance notions of artistic competition deserve further attention, although they have been the focus of studies by Kosegarten, “The Origins of Artistic Competitions in Italy”; Sachs, “Zur Geschichte des Künstlerischen Wettbewerbs”; and Cahn, *Masterpieces*.

⁵⁷ For example, Leonardo frequently tested theorems of optics by conceiving mechanical demonstrations of the laws governing the action of light. Veltman, *Studies in Leonardo da Vinci I*, has recently attempted to reconstruct models associated with demonstrations and experiments described in Leonardo's notes. Any reconstruction of Leonardo's demonstrations, however, ought to consider the relationship between poetic invention and “thought experiments” for the purpose of illustrating theoretical ideas: on the latter see, Clagett, “Some Novel Trends in the Science of the Fourteenth Century.” The relationship between Leonardo's writings on the comparison of the arts and his actual artistic practices has been studied by M. Kemp, “Leonardo da Vinci e lo Spazio del Scultore,” whose remarks on the sculptural origins of Leonardo's painting practices suggest many avenues for future investigations.

competing both with human rivals and with nature.⁵⁸ In one version of the origin of Renaissance rivalries between painting and sculpture, Vasari claimed that artists debated the merits of Giorgione's painting of *St. George*, where the figure is seen from all sides, in front of an actual sculpture, Verrocchio's equestrian monument of *Bartolommeo Colleoni*.⁵⁹

Leonardo's descriptions of artistic procedures, as Chapter Four will elaborate, fall midway between the figured language first associated with medieval allegories and midsixteenth-century discussions of actual artistic procedures. But the conception of painting as an experiment or demonstration piece runs throughout his comparisons of the arts. Leonardo's ideas must have germinated during his artistic training in Florence, where famous experiments in perspective were performed earlier in the century. As early as 1413, Brunelleschi publicly demonstrated the geometric principles of perspectival diminution in his two well known panels, and in 1435–36, Alberti, in *della Pittura*, prescribed geometric procedures for constructing the representation of three-dimensional space on a two-dimensional surface to students of painting.⁶⁰ According to an anonymous fifteenth-century biography, Alberti himself constructed similar experiments that consisted of peepshows designed to demonstrate certain "miracles of painting."⁶¹ Sculptural models as well as drawings were also routinely prepared for juries awarding commissions, the most famous competition of all perhaps being the panels submitted in 1402 for the north doors of the Florentine

⁵⁸ The modern fate of this anecdote has been studied by van der Waal, "The *Linæ Summæ Tenuitatis* of Apelles," and Gombrich, "The Heritage of Apelles." Van der Waal, 8, cites Ghiberti's *Commentari*, c. 1450, and, 59–61, notes that the philologist Louis de Montejosieu, who wrote at the end of the sixteenth century in terms consistent with the current reform of painting—but also in line with Leonardo's discussion of painted *rilievo*—was the first to suggest that Pliny referred to the subtle variation of *lux*, *splendor*, and *umbra*. (Gombrich independent of Montejosieu offers the same interpretation.) Luca Pacioli, *De divina proportionē*, Chapter 3, fol. Biii, compared the contest between Zeuxis and Parrhasios also told by Pliny with the unsurpassed effects of Leonardo's perspective. Leonardo himself embroidered Plinian anecdotes on the theme of illusionistic feats, in two *Parte Prima* passages praising pictorial perspective (Chapters 7 and 14). Staged battles between painters apparently took place, at least in one instance recorded by Angelo Decembrio (see the introduction to the Commentary Notes on poetry).

⁵⁹ Vasari, *Vite*, ed. Bettarini and Barocchi, 3: 46, in the 1568 edition of his biography of Giorgione.

⁶⁰ The literature is too extensive to cite here, but see Edgerton, *The Renaissance Rediscovery of Linear Perspective*, 143–152; for the dissimilarities between the methods of Brunelleschi and Alberti, see M. Kemp, *The Science of Art*, 11–26, whose dating is followed here.

⁶¹ See Edgerton, *The Renaissance Rediscovery of Linear Perspective*, 88–89, on Alberti.

Baptistry.⁶² Generally speaking, procedures for commissioning civic art resemble the institutional practice of submitting a “masterpiece” to a board of examiners to request entry into a guild. As Walter Cahn has argued, such demonstrations, judged by committee, imply the existence of normative criteria, and the documents, both visual and literary, record an increased emphasis by the end of the Middle Ages on graphic invention over manual skill.⁶³

The arts of painting and sculpture in particular were cross-fertilized by experiments with pictorial perspective like Ghiberti’s sculpted reliefs for the east doors of the Baptistry. Leonardo, like his immediate artistic antecedents such as Antonio Pollaiuolo, developed revolutionary pictorial procedures for representing three-dimensional forms that originated in the study of sculpture. These new methods of invention also contributed to shared (if not entirely universal) criteria for judging the individual arts. Indeed, Leonardo’s comparisons of the arts can hardly be appreciated without considering such displays of artistic skill, specifically demonstrations of the *difficoltà* of art like *figure serpentine*, *chiaroscuro*, *scorci*, and other conscious pictorial embellishments. These are the mainstays of his praise throughout the comparisons of the arts and outstanding features of his artistic practices in both painting and sculpture.⁶⁴

Among the virtuoso demonstrations that can be directly associated with Leonardo’s first Florentine period are two battlepieces, Pollaiuolo’s *Battle of the Nudes*, engraved in the 1470s (Figure 5), and Verrocchio’s lost cartoon for a *Battle of Nude Gods*.⁶⁵ By the time that Leonardo accepted the commission for the *Battle of Anghiari*, which he carried out in direct competition with Michelangelo’s

⁶² Krautheimer, *Lorenzo Ghiberti*, 279 ff., discusses evidence connected with the first commission for the Baptistry doors; p. 302, where Krautheimer cites a letter of protest by Leonardo Bruni (reproduced as document 52, p. 372), author of the rejected program for Ghiberti’s later East Doors who argues that artists do not need *scientia* or the natural sciences (*materiae rerum cognitio*), he adduces indirect but nonetheless significant evidence that artists well before Leonardo considered themselves natural philosophers. Ghiberti’s scientific interests led him to compile in the third book of his *I Commentarii* an anthology of writings on perspective by the same leading optical theorists in the tradition of Alhazen that Leonardo utilized about three decades later.

⁶³ Cahn, *Masterpieces*, 12 and 18.

⁶⁴ Summers, “Figure come fratelli,” especially 66 ff. relates Pollaiuolo’s artistic procedures, and similar practices by later artists ranging from Raphael to Pontormo to Daniele da Volterra, to the *paragone* debates. On these procedures, see also Fusco, “Antonio Pollaiuolo’s Use of the Antique.”

⁶⁵ These examples are cited by M. Kemp, *Leonardo da Vinci*, 37–39, in his discussion of demonstration pieces of modern anatomical prowess achieved through the acquisition of theoretical sciences that vie with classical antiquity.

Battle of Cascina, Bertoldo di Giovanni's bronze battle relief and Michelangelo's own youthful emulation of it in his *Battle of Lapiths and Centaurs* had been added to this exemplary series (Figures 6, 7, and 8).⁶⁶ "Battlepieces" like these imply that contemporary audiences understood them as concrete images that carry significance beyond their literary content, which is often overgeneralized and schematic at best. The message seems to be that human artifice consciously vies with the procedures of nature as well as with its products. We will return to this theme later in this chapter, when we examine the textual tradition that supports such a reading.

The Oral Tradition

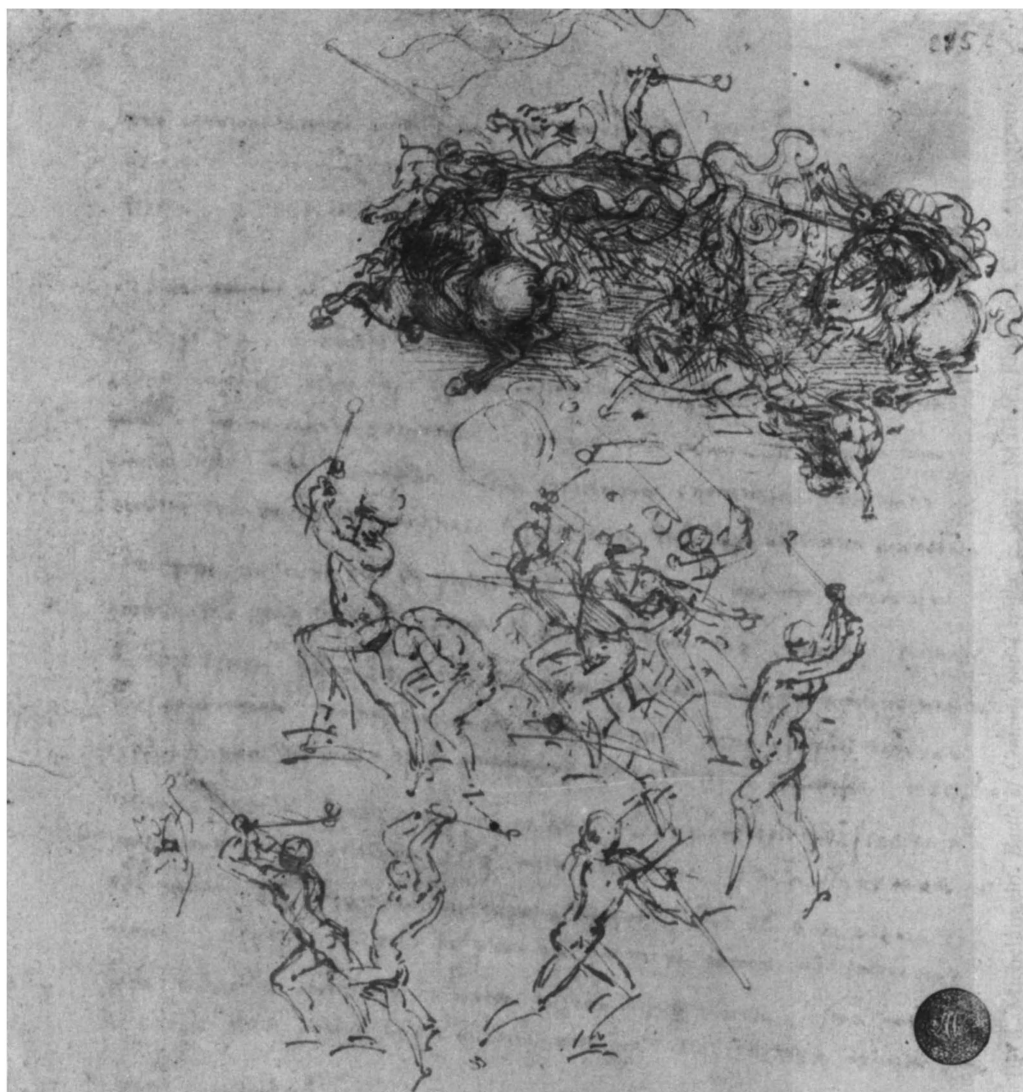
It is possible that the convergence of various rhetorical traditions in the Renaissance literature on art may have been importantly affected by a tradition of oral discourse conducted in the actual presence of art objects. The remains of Duke Federico's *studiolo* in Urbino and other similar collections, like the illustrious treasures of King Matthias, provide suggestive evidence of how works of art might have served as objects of conversation.⁶⁷ Learned discourses by humanist collectors on the subject of the liberal arts might have proceeded by comparative analysis, on the ancient models of Philostratus, Pliny, and others, in the extemporaneous form of visual discoveries made in the presence of actual objects. The evidence suggests that such an oral tradition existed in Leonardo's day, and that Leonardo's praise of painting as filled with "discourses" refers not only to his own scientific practices, but also to an oral tradition of art appreciation. Ancient literary sources imply

⁶⁶ Summers, *Michelangelo*, 254–255, has connected Bertoldo's and Michelangelo's sculpted reliefs with Poliziano's definition of *graphike* and *pictura* as one which accords primacy to the art of sculpture.

⁶⁷ See Cheles, "'Topoi' e 'Serio Ludere'" and *The Studiolo of Urbino*, 62, with references to another key precedent, for the main hall of the Casa Marta Pellizzari in Castelfranco, decorated in the opening years of the Cinquecento with friezes ascribed to Giorgione, including personifications of the liberal and mechanical arts represented by means of symbols alone (like Federico's Urbino *Studiolo*). Studies of Renaissance collecting habits are too numerous to list here, but a useful introduction is Wackernagel, *The World of the Florentine Renaissance Artist*. See also Weiss, *The Renaissance Discovery of Classical Antiquity*. In the present context it might be mentioned again that Giovanni di Prato, *Paradiso degli Alberti*, composed before 1430 and set in the year 1389 in a villa near Florence, opens with a vision of an imaginary voyage to an ancient loggia of the type described by Philostratus the Elder, which inspires the characters to gather at the Villa Paradiso to discuss *dubbi* and recount *novelle*, including a discussion of whether one art possesses more *ingegno* than another (cited in Crane, *Italian Social Customs*, 96, with further comparisons). For evidence of how the guild system also encouraged virtuoso displays of artifice, see Cahn, *Masterpieces*.



III. 5. Antonio Pollaiuolo. *Battle of Nude Men*. Engraving. 1470s. London, British Museum.



Ill. 6. Leonardo da Vinci. Battle of horsemen and foot soldiers. Preparatory study for *The Battle of Anghiari*. c. 1504. Pen and ink. Venice, Accademia.



Ill. 7. Bertoldo di Giovanni. *Battle Relief*. Before 1491. Bronze. Florence, Museo Nazionale del Bargello.



Ill. 8. Michelangelo. *Battle of Centaurs and Lapiths*. c. 1492. Marble. Florence, Casa Buonarroti.

that informal variations on the *agon* were an intellectual sport endemic to classical Greek culture. Plato's *Symposium*, for example, celebrates the victors of a poetic contest held the previous day with a banquet of further discourses on the nature of poetic inspiration—a literary archetype of the activities associated with ancient Musea, which offered lectures, discussions attended by luminaries and even kings, and symposia where riddles and problems were debated after dinner and literary prizes awarded.⁶⁸

The Renaissance revived this ancient tradition—for instance, at Cosimo de' Medici's villa at Careggi, the new Platonic Academy, where Marsilio Ficino associated a special kind of discourse with each space of the villa.⁶⁹ One may imagine a fifteenth-century art collection installed in imitation of an ancient Museum, transformed by the intervening influence of medieval courtly literature, which often included imaginary conversations in front of paintings filled with allegorical figures, usually on themes of love.⁷⁰

The motif of the palace filled with paintings originates in ancient literature. In the introduction to the *Imagines*, Philostratus the Elder describes how he delivered extemporaneous discourses on paintings assembled in the Loggia of a discerning collector, “resplendent with all the marbles favoured by luxury, but . . . particularly splendid by reason of the panel-paintings set in the walls.” In verbal images that vie with the subjects of his *ekphraseis*, Philostratus praises both the paintings and the acumen of their owner, who collected them “with real judgment for they exhibited the skill of very many painters.”⁷¹

Philostratus interpreted paintings; Callistratus described sculptures; in his travels Pausanias recorded his appreciation of Greek architecture; Pliny the Younger described a statue that he kept in his library.⁷² Similar discourses, modeled on ancient literary prece-

⁶⁸ This literary archetype can be referred to Plato's Academy, specifically the museum there, which was, like the most famous one later at Alexandria, an educational institution that housed scholars and supported research. The Muses are also associated with the origin of the arts, one of the earliest visual examples of this tradition being the Corinthian representation of Calliope on the François Vase. See Boyancé, *Le Culte des Muses*; Ettlinger, “Muses and Liberal Arts,” which includes an excellent bibliography.

⁶⁹ In the gardens, “poets will hear Apollo sing beneath the laurels”; in the vestibule, “orators will watch Mercury declaiming”; lawyers and statesmen will gather under the portico, and philosophers in the inner sanctuary: cited by Comito, *The Idea of the Garden*, 81.

⁷⁰ Weiss, *Renaissance Discovery of Classical Antiquity*, gives an overview of the writing activities of humanist collectors.

⁷¹ Philostratus, *Imagines* (Bk. 1.1, 294K–296K), 2–3.

⁷² Weiss, *Renaissance Discovery of Classical Antiquity*, 59 ff., cites Pliny and fifteenth-century parallels.

dents, may have taken place in the houses of fifteenth-century antiquarians and collectors of art such as Duke Federigo of Urbino. Illusionistic intarsia panels that survive from the duke's *studiolo* symbolize the virtues and the liberal arts through still-life objects such as small sculptures, scientific instruments, books, and so on, some of which Piero della Francesca and Francesco di Giorgio may have designed (Figure 9).⁷³ These ingenious perspectives would no doubt have amused the Duke and his friends in much the same way as the mathematical puzzles called *ludi*, included in practical handbooks of geometry, which also appealed to aristocratic tastes.⁷⁴ The great humanist ruler and his learned companions would have been able (and probably could not have resisted the urge) to improvise erudite conversation as they admired the array.

Later instances document the existence of such an amateur tradition of art appreciation encouraged by the antiquarian pursuits of humanist scholars.⁷⁵ Texts connected with Urban VIII's Palazzo Barberini illuminate the way humanist collectors in early seventeenth-century Rome treated their treasures.⁷⁶ The architectural decoration of the Palazzo seems to be intentionally modeled after an ancient Museum, and Girolamo Teti's contemporary guide

⁷³ See Cheles, *The Studiolo of Urbino*, 53, n. 2.

⁷⁴ Davis, *Piero della Francesca's Mathematical Treatises*, 62, notes that the appellation "Maestri di prospettiva" was "by and large the term applied to intarsia workers." Practical handbooks of geometry, called *abbacchi*, have been studied by van Egmond, *Practical Mathematics in the Italian Renaissance*; Piochi, "Il Trattato di Paolo dell' Abbaco"; Goldthwaite, "Schools and Teaching of Commercial Arithmetic in Renaissance Florence." As these writers note, purely mathematical problems appealed to those with sufficient leisure time to solve them.

⁷⁵ Weiss, *Renaissance Discovery of Classical Antiquity*, offers an excellent survey of early humanist collecting habits; see 30–48 ff. for an account of Petrarch and Boccaccio and their contemporaries. For later collections of modern artefacts and antiquities, see von Schlosser, *Kunst-und Wunderkammern*; Haskell and Penny, *Taste and the Antique*; *The Origins of Museums*, ed. Impey and MacGregor. As early as 1572, members of the Accademia del Disegno devised a unified program for the collection in the *studiolo* of Francesco de' Medici, as explained by Vincenzo Borghini in his correspondence with Giorgio Vasari (Frey, *Il Carteggio* 2: 522–530). This and earlier art collections, such as the sculpture court of the Vatican Palace and Leon Alberti's description of the ideal sculpture and painting court (*De re aedificatoria*, Book 9, Chapter 4, are discussed in the context of early methods of collecting *naturalia* and *artefacta*, by Elisabeth Scheicher, "The Collection of Archduke Ferdinand II at Schloss Ambrass: Its Purpose, Composition and Evolution," in *The Origins of Museums*, 29–38.

⁷⁶ Another contemporaneous project along similar lines is mentioned by Mahon, *Seicento Art and Theory*, 237–238, where he notes that Leonardo Agostini, a Siennese antiquarian in the entourage of Cardinal Francesco Barberini, had a "museo" in the Via della Madonna di Constantinopoli, according to Bellori (*Note delli Musei, Librerie, Gallerie nella Roma* [Rome, 1664]). Preziosi, *Rethinking Art History*, 90–92, who suggests that connoisseurship techniques developed in this environment, argues that this scientific art was indebted to previously developed



III. 9. Studiolo of Federico da Montefeltro. 1470s. Intarsia. Urbino. Palazzo Ducale.

to the collection reads like a technical manual for imitating the pseudo-extemporaneous discourses of the Philostrati.⁷⁷

Teti provides engraved views of the Palazzo and an elaborate description of just how to contemplate paintings eloquently. The Exedra of this Palazzo [like the Exedra of an ancient Museum] is, he says, "extremely favorable to literary exercises," which ought to be set forth there.⁷⁸ Teti suggests, for example, placing the inscriptions and ordering them, and then describing, delineating, taking comparative examples, and discussing which work of art is preferable. Teti's own literary exercise, abundantly sprinkled with citations from Cicero, Diogenes Laertius, Plutarch, and other ancient men of letters, is based on a series of comparisons among the paintings and sculptures assembled there as moral exemplifications honoring the Barberini family.⁷⁹

Teti's method of discoursing on art has precedents in works by Dante, Boccaccio, Giovanni del Prato, Francesco Colonna, Castiglione, Pietro Bembo, and others writing in the medieval tradition of eclogues, where *dramatis personae* interpreted paintings, statues,

techniques of medical diagnosis and cites additional evidence: Camille Boldi, court physician to Urban VIII, was the author of a 1622 treatise on handwriting analysis who also wrote about painting for amateurs.

⁷⁷ Tezio, *Aedes Barberinae ad Quirinalum*, a lavish description accompanied by engravings of the interior of the palace, built for the family of Pope Urban VIII, Maffeo Barberini. A second important document is the contemporary description of the palace in the form of an epic poem written by an anonymous Florentine, probably Francesco Bracciolini, entitled "Il Pellegrino ovvero la dichiarazione della Sala Barberina" (Vatican Barb. Lat. 433J), published by Magnanimi in *Palazzo Barberini* and discussed by the same author in "Palazzo Barberini: La Sala Ovale." I thank Mary Alice Lee for guiding me to these sources.

⁷⁸ Tezio, *Aedes Barberinae*, 171; he also compares the Exedra to a Parnassus (170).

⁷⁹ Tezio, *Aedes Barberinae*, 272–273. Marble portraits including members of the Barberini family are correlated to ancient exemplars of virtue and vice. To illustrate such oral exercises, Tezio delivers a "paragone," then he contrasts the "purity" of these marble "effigies" with paintings set on panels that emulate statues ("quasi Statuarum aemulae"). The corresponding statues content the viewer only with line, without the veil of color; the program considered as a whole "non picturam aemula, sed aeternitatem ipsam aemulantia." Teti's companion piece, attributed to Bracciolini, is similarly an exercise to improve visual judgment through verbal discourse. The author describes being moved by the act of contemplating paintings to admire their "licenza" and in doing so to discuss the "perfettionate tute l'arti." This leads him to compare (*paragoni*) the "ingegni grandi" of Michelangelo, Dürer, and Raphael, whose "finezza di giudizio, che produce effetti così meravigliosi" is difficult to find outside Rome (Barb. Lat. 4,368, Magnanimi, "La Sala Ovale," 33). His literary formula recalls Dolce's *L'Aretino*, or even Giovanni del Prato and Boccaccio, and other early seventeenth-century examples, such as Alphonse Dufresnoy's *De arte graphica* (1637), Agucchi's analysis of Annibale Carracci and related efforts by Agucchi's contemporaries are cited by Mahon, *Seicento Art and Theory*, 41–42, 149 ff.

and architecture by asking *dubbi* or questions on love in the presence of these images.⁸⁰ And Cardinal Federico Borromeo, patron and critic of the arts, provides a link with written panegyrics. Borromeo, who collected Leonardo's manuscripts and hoped to have them published, described his own collection in a pamphlet entitled *Musaeum*, a guide written in 1625.⁸¹ His collection included not only original works but also copies, for he intended in this way to preserve works that might otherwise be subject to decay. This policy motivated his inclusion of Andrea Bianchi's copy of Leonardo's *Last Supper*, which Borromeo praised as being "among the precious things of our Museum."⁸² Given this interest in Leonardo, it is conceivable that Leonardo's defense of painting underlies Borromeo's *apologia* for the collection:

I knew full well that the ancients resorted to the pen in order to conserve the most excellent works of painting, sculpture, and architecture. . . . while whole cities including palaces and museums have been destroyed by fire, writings hidden away in obscure and vile places escaped fire and ruin. . . .⁸³

Borromeo's text continues with a commonplace comparison between pen and brush: "winning for endurance over the arches, pyramids and other monuments on which human riches were lavished . . . in fact, the writers by putting the pen in competition against the brush and the chisel were able to reproduce the work of the latter so well that a doubt remains as to which of the two sides the victory should be attributed."⁸⁴

⁸⁰ See references cited in n. 24.

⁸¹ Borromeo, *Musaeum*, Milan, 1625. The collection had been acquired in 1614 by Count Galeazzo Arconati from the estate of Pompeo Leoni, the great speculator of Leonardo drawings and manuscripts. Leoni had bought up Leonardo material on a vast scale, assembling the scrapbook known as the *Codex Atlanticus*, consisting of over 1,000 sheets, now in the Biblioteca Ambrosiana in Milan, and part of the Windsor Royal Collection. On Leoni and the history of Leonardo's manuscripts, see Pedretti, *Commentary*, 2: 393–402. On Borromeo's collection, see most recently Jones, "Federico Borromeo as a Patron of Landscapes and Still Lifes"; and "Federico Borromeo's Ambrosian Collection"; (I thank the author for making the latter article available to me in typescript). See Quint, *Cardinal Federico Borromeo*, 22–27, for the notation that the collection was given to the Ambrosiana in 1637, six years after the Cardinal's death (although there is evidence that Arconati retained some of the manuscripts).

⁸² Quint, *Cardinal Federico Borromeo*, 43–44. The text in Quint's translation, 249, continues as follows: "and will increase more in value every day because the work of Leonardo is now spoiled and already almost entirely lost, though it was always considered a treatise." Attention was first drawn to Borromeo's attitudes toward art by Beltrami, as cited by Quint, 275–276. The Borromeo collection included other Leonardesque works, for instance, a drawing by Bernardo Luini (cited by Quint, 241).

⁸³ Borromeo, cited by Quint, *Borromeo*, 223.

⁸⁴ The same formula Leonardo uses in Chapter 19 of the *Parte Prima*, excerpted

Renaissance Adaptations of Traditional Forms

The first modern critical appreciations of actual art objects were recorded by early humanist antiquarians, collectors such as Niccolò Niccoli and Giovanni del Pontano, and humanist educators such as Alberti, Bartolommeo Fazio, and Angelo Decembrio.⁸⁵ By the end of the fifteenth century, renowned collections of ancient objects and modern imitations *all'antica*—coins and gems, vases, marbles, small bronzes, and paintings—attest to the learned connoisseurship of an educated audience tutored, through ancient texts and imitations of ancient texts, on just how to look at art.

The first modern comparison of painting and sculpture to come down to us appears in an early humanist work, the first modern treatise on painting, Leon Battista Alberti's *della Pittura/De pictura*, Book Two of which begins with an extensive panegyric praising painting. Alberti elaborates a comparison of painting, sculpture, and architecture with examples taken from Pliny, Plutarch, and Cicero. His unqualified praise for the artist's inventive powers, or *ingegno*, is unique to this passage, which finds its closest parallel in ekphrastic descriptions that extol the artist's *fantasia*.⁸⁶ Leonardo studied Alberti's treatise critically, as we know from numerous passages in his notebooks.⁸⁷ His theoretical considerations of painting were fundamentally shaped by it, and some of his comparisons of the arts derive directly from Alberti's treatise. Yet

from *Ms. A*, was in Count Arconati's collection and therefore accessible to Borromeo at the time he wrote his guide. Bell, "Cassiano dal Pozzo's Copy of the Zaccolini Manuscripts" notes that when Cassiano noticed that passages from *Ms. A* had not been included in the abridged manuscript of Leonardo's *Trattato*, it inspired him to add supplements to his planned publication treatise. In this process of checking manuscripts, the passages under discussion would without doubt have come to the attention of Leonardo's editors. Quint, 260, also notes that Luca Beltrami discovered that Borromeo's observations depend in part on Federico Zuccaro's *L'Idea dei pittori, scultori, ed architettori* (Turin, 1607), who had access to Leonardo's writings (on which see Pedretti, *Commentary*, 1: 34).

⁸⁵ Literature on early collecting activities is too extensive to summarize here, but in addition to the sources already cited, for early testimonies see the references to Baxandall listed in the Consolidated Bibliography and Marcantonio Michiel's descriptions of North Italian collections; his *Notizia d'opere di disegno*. A vogue for paintings and sculptures that illustrated ancient poetic themes, after Ovid, Virgil, Apuleius, and other ancient writers, emerged alongside this collecting activity: see recently, Marek, *Ekphrasis und Herrscherallégorie*, especially 38–74, on the "Camerino d'Alabastro," the studiolo of Alfonso d'Este in Ferrara. It seems likely that this development, too, can be referred to the art of appreciating art through discourse.

⁸⁶ Alberti, *On Painting*, Book 2: 25–29. Everywhere else except in this passage, Alberti echoes Horace by stating that artistic invention must be subordinate to decorum, because the *istoria* serves an edifying purpose.

⁸⁷ See discussions at CNs 21, 12, 19, 10, 28, 39. Chapter Three treats the relationship to Alberti's treatise on painting, as revealed by the manuscript evidence.

Leonardo overturned Alberti's generally restrained view of artifice to praise the painter's unrestrained license, which, by contrast to Alberti, he defined purely in terms of stylistic decorum.⁸⁸

Alberti's treatise consciously imitates classical rhetorical theory, while Leonardo's defense of painting is also related to medieval poetry; both, however, descend from the broader tradition of epideictic rhetoric. In the course of the Renaissance, various types of medieval and ancient epideictic rhetoric were conflated and adapted to new uses. This process resulted, among other things, in comparisons among the arts in an unprecedented variety of new literary forms. For example, Ludovico Dolce's comparison of the arts occurs in a dialogue whose general form is similar to that of Cicero's *De oratore*, which presented rhetorical theory also in dialogue form. But Paolo Pino's dialogue on painting, which has often been compared to Dolce's scheme because it likewise defines painting under the rhetorical categories of *disegno* or *giudicio*, *invenzione*, and *colorire*, is indebted to medieval courtly love literature. Varchi's essays are logical discourses, constructed like Scholastic disputations and textual commentaries. Sixteenth-century writings are as varied in form as the passages compiled in Leonardo's *Parte Prima*.

THE SUBSTANTIVE SOURCES OF POLEMICS COMPARING THE ARTS

Renaissance polemical comparisons of the arts, no matter how inventive, also follow set forms of praise and blame and therefore cannot be called art criticism, in the modern sense of an ostensive interpretation or explication of an actual work of art. Yet writings comparing the arts are an important historical contribution at the foundation of modern critical literature, because Leonardo and his

⁸⁸ Heydenreich, Introduction to Leonardo da Vinci, *Treatise on Painting*, ed. McMahon, 1: xxv, notes that Leonardo may have come to Albertian ideas also through Piero della Francesca and Filarete. Rusk, "The Paragon of Leonardo da Vinci," 57, stresses the similarity between Filarete's treatise on architecture and Leonardo's definition of painting as a mathematical science, which, as Rusk was the first to point out, is different from Alberti's definition of painting as a physical geometry. It seems that Leonardo also evaluated Alberti's rhetorical theory of pictorial composition in light of actual studio practices. For example, he criticized Alberti's recommendations for composing groups of figures in an *istoria* on the model of a Ciceronian period, because when the whole group is considered as a single unit, the overlapping of figures can spoil their arrangement. In this case, Leonardo recommended an amendment to Alberti's scheme: "see that you draw [the figures] in their entirety, so that the limbs which are seen appearing beyond the surface of the first figure may retain their natural length and position" (CA 160 ra; translation cited from MacCurdy, *The Notebooks of Leonardo da Vinci*, 2: 277).

sixteenth-century successors introduced serious substantive issues concerning the nature of representation (often masquerading as conventional topics of poetic debate, such as comparisons of the senses). Of course, these substantive issues, too, have histories. When Leonardo proposed a new position for painting in the hierarchy of the sciences, he was entering a historical debate on the reclassification, and indeed the very basis, of human knowledge.⁸⁹ His interpretation of painting as a form of knowledge is central to his polemical defense of its superiority over other disciplines: poetry, music, sculpture, and occasionally the mechanical arts, astronomy, and formal optics.

Leonardo's artistic predecessors, Cennino Cennini, Lorenzo Ghiberti, Filarete, and Piero della Francesca, defined painting along scholastic lines, as a discipline requiring theoretical knowledge, or *scienza*, concerned with the study of optics.⁹⁰ As early as 1390 Cennino had also associated *scienza* with the painter's *fantasia*, which he in turn compared with the poet's freedom of invention.⁹¹ By 1435 humanists Alberti and Lorenzo Valla welcomed the triad of painting, sculpture, and architecture to the threshold of the *artes liberales*.⁹² Alberti's architectural treatise, written in the early 1450s, argued that knowledge of painting and mathematics was absolutely essential to the architect (*De re aedificatoria*, Book 9, Chapter 10). By

⁸⁹ Leonardo first (around 1503–1505) formulated a scheme that placed painting immediately after geometry and ahead of astronomy and optics, but even in earlier writings, he argued that painting should be included among the liberal arts because it is founded on perspective. See discussion in Chapter Three. The division of the mathematical sciences into the continuous and discontinuous quantities headed by geometry and arithmetic, a scheme which originates with Boethius (*De institutione arithmetica*, 1.1), was well known from Scholastic classifications of the sciences (see Marietan, *Problème de la Classification des Sciences*).

⁹⁰ A brief survey of Leonardo's precedents is given by Heydenreich, Introduction to Leonardo da Vinci, *Treatise on Painting*, ed. McMahon, 1: xxiv ff. See further Boskovitz, "Quello ch'è dipintore oggi dicono prospettiva." For recent guides to the extensive literature see Emiliani, "La questione della prospettiva"; Parronchi, *Studi su la dolce prospettiva*; Edgerton, *The Renaissance Rediscovery of Linear Perspective*; Vagnetti, *De Naturali et Artificiali Perspectiva*, an excellent bibliography of primary sources, and M. Kemp, *The Science of Art*.

⁹¹ Cennini, *Il libro dell'arte*, chapters 1–2.

⁹² For an introduction to the humanist issues, see Kristeller (1956), Gray, Seigel (1968); Eugenio Garin (1982), and Gilbert (1971) cited in the Consolidated Bibliography. Most of the attention devoted to humanist classifications of knowledge, however, has been in connection with the origins of the term "Renaissance." The essential essay is by Ferguson, "Humanist Views of the Renaissance." For a summation of these issues, see Panofsky, *Renaissance and Renascences in Western Art*, Chapter 1; p. 16, citing Lorenzo Valla's preface to *Elegantiae linguae latinae*, composed between 1435 and 1444 (Lyons, 1548, 9), an influential scheme later employed by Filippino Villani, Vespasiano da Bisticci, Erasmus, Vasari, and others, as Panofsky notes. A number of humanist polemics are collected in Müllner, *Reden und Briefen Italienischer Humanisten*. See further discussion at CN 28.

the end of the Quattrocento, several humanist writers were proposing new classifications of the productive sciences. These included Giorgio Valla, whose encyclopedia *De expetendis et fugiendis rebus*, published in 1501, Leonardo owned. Valla (like Leonardo) insisted that the practical arts were founded theoretically on the mathematical principles of harmony. In Valla's scheme, theoretical sciences ordered to practical use replaced Hugh of St. Victor's seven mechanical arts (traditional throughout the later Middle Ages) and were equal to the practical liberal arts.⁹³ Poliziano, another humanist who, like Giorgio, was indebted to Lorenzo Valla's revised classification of knowledge, derived a classification for painting from an ancient neopythagorean treatise on arithmetic by Nicomachus of Gervasa. Poliziano described painting as an art belonging to the mathematics of architecture, a mechanical art related to the physical sciences subalternate to arithmetic, and he devised a plan for a universal system of knowledge that associated painting, and other "menial arts" founded on "graphike," with mathematics.⁹⁴

Debates on the Classification of the Liberal Arts

The relationship between Scholastic writings and early humanist discussions of method has yet to be fully investigated, but it seems that in the fifteenth and sixteenth centuries Scholastics and humanists proposed conflicting schemes for organizing knowledge. All writers agreed that the sciences were interrelated and hierarchical, rather than autonomous as they are considered today: the higher, theoretical sciences must contain the principles demonstrated in the subordinate, physical disciplines, and the highest science must subsume the principles of the lower ones. But whereas the early humanists, beginning with Petrarch, proposed that eloquence should join philosophy at the top of the hierarchy, the Scholastics were more interested in elevating perspective, which they in fact added to the Quadrivium of mathematical subjects taught in the upper portion of the university curriculum since the early fourteenth century. Indirectly, then, poetry and perspective were competing for recognition in a revised canon of the liberal arts.

⁹³ Valla also referred to the practical liberal arts under the single heading of "armonia" and exalted them for their communicative function (*De expetendis et fugiendis rebus*, 1502, discussed by Vasoli, "Note su Giorgio Valla").

⁹⁴ Poliziano, *Panepistemon* (1490), in *Opera Omnia*, 470. See further discussion at CNs 23 and 28.

While it is unlikely that Leonardo could have had a clear schematic overview of the epistemological conflicts, this history helps to explain the importance of poetry as an antagonist in the *Parte Prima*. Some Renaissance writers defined painting as a liberal art precisely on the grounds of its association with poetry. For example, Alberti defined painting as a physical science—near the lower end of Aristotle's scale, although Alberti's text is not clear on this point—but he associated painting with the liberal arts especially for its similarity to poetry.⁹⁵ Leonardo, on the other hand, although he agreed with Alberti on many other issues, contended that poets invent “lying fictions about the works of man,” fictions that are the “weakest part of painting” (*Parte Prima*, chapters 27 and 32). His position, that painting was, rather, a science founded on perspective, can be traced to the Scholastic tradition, as it was shaped by Thomas Aquinas. Among Leonardo's immediate contemporaries, Fra Girolamo Savonarola defined a similar position for perspective among the hierarchy of the sciences.⁹⁶ Other classifications composed in the fourteenth century had included perspective in the Quadrivium; the argument that resembles Leonardo's most closely was a variant on these written by another Scholastic, his close associate, the mathematician Fra Luca Pacioli.⁹⁷

Following primarily Aristotle and Hugh of St. Victor, who was influenced by Arabic sources, Aquinas classified the sciences

⁹⁵ Compare Alberti, *On Painting* 1: 2; 2: 26–28; and 3: 53.

⁹⁶ On Girolamo Savonarola and Leonardo, see R. Klein, “Pomponius Gauricus on Perspective,” 211. Science has quite a different meaning for us than *scienza* had for Leonardo and other writers discussed in this study. The Latin term *scientia*, as John Weisheipl explains, “was used to designate a discerning, penetrating, intellectual grasp of a situation or of a given subject. Technically it was employed of knowledge that explained the situation fully and accurately through all or any of its true causes. . . . In other words, in medieval usage the term ‘science’ was given to every field of intellectual endeavor in which true causal explanations could be discovered.” Weisheipl, “Classification of the Sciences in Medieval Thought,” 55.

⁹⁷ Luca Pacioli, *De divina proportionione* (completed 1498) (Venice, 1509), Chapter III (excerpted in *Scritti*, 1: 63–65). On fourteenth-century arguments by Biagio Pelacani and Domenico da Clivasso, see Federici-Vescovini, *Astrologia e scienza*, 68, and “L’Inserimento della ‘Perspectiva’ tra arti quadrivio,” in *Arts Libéraux et Philosophie au Moyen Âge*, 969–974, and “Les questions de ‘perspective’ de Dominicus de Clivaxo,” 232–246. Da Clivasso's manuscript was in the library of San Marco monastery in Florence. On the revised university curriculum, see *Arts Libéraux et Philosophie du Moyen Âge*, especially the contributions by Kibre, Murdoch, and Weisheipl. Many documents of the controversy over method were first printed in the 1480s, and Leonardo probably owned at least one of the most important publications. Randall, “The Development of Scientific Method,” 282, notes that in 1496 Albertus of Saxony's *Tractatus de proportionibus* was published together with Walter Burleigh's *De intentione et remissione formarum*, a volume which corresponds to an item Leonardo recorded in the *Madrid Codex* booklet, according to Reti, *The Madrid Codices* 3: 93, n. 10.

according to the nobility of their subjects in relation to mathematics, the only discipline capable of achieving certainty.⁹⁸ In his view humans were distinguished from animals by art and by discourse, a kind of logic or act of reason “resembling nature,” specifically the resolution of effects into their causes.⁹⁹ In his system of classification, widely adopted by Scholastic writers, the sciences limited to “opinion” are lower than sciences that achieve “scientific knowledge” (Aquinas, *Comm. to Boethius, In De trinitate*, qu. 5.4.7). Aquinas divided the rational sciences into three branches of discourse arranged in descending order of certitude as the judicative, inventive, and sophistic modes of logic. Poetry, in this scheme, uses inventive logic, which results in belief or opinion: for the poet is concerned with conjecture and “induces something virtuous by means of representation” (*Comm. to Aristotle, Post. Anal.*, Lecture 1.1.5). Leonardo echoes this assessment of poetry in many passages, most notably in the second chapter of the *Parte Prima*, which concerns the relative degrees of demonstrability of the sciences. This argument provides a significant connection between his invective against poetry and his definition of painting as a mathematical science.

Although the issues are more complex than this discussion will suggest, early humanists evolved a defense of poetry based not on its epistemological value in a scale of human knowledge, but on its association with theology. On the grounds that poetic inspiration is a form of revealed knowledge, Petrarch claimed that figured language deserves to be placed next to theology, at the summit of the

⁹⁸ See Thomas Aquinas, *In de Trinitate*, Qu. 5.4.7; see further, *Division and Methods of the Sciences*, ed. Maurer. Hugh of St. Victor formulated the scheme of the seven mechanical arts (corresponding to the seven liberal arts) used throughout the later Middle Ages: see most recently Ovitt, *The Restoration of Perfection*; Summers, *The Judgment of Sense*, 238 ff., especially 251–265. Al-Farabi’s classification of the sciences was extremely influential in the West: see Wingate, *The Medieval Latin Versions of the Aristotelian Scientific Corpus*, 26–32.

⁹⁹ Thomas Aquinas took his definition of *discursis* from Aristotle’s *Posterior Analytics*. Aristotle put events in the physical world in conformity with the structure of a mathematical demonstration by taking as the premise that which in nature is more known to us (*Post. Anal.* 95a25). But, since effects in nature may not exist simultaneously (the terms of a syllogism must be contemporaneous), the starting point must be the immediate, and the cause of one will be the coming to be of another. Things that come to be in each and every case are universal (96a9). This situation describes experience resulting in a habit of science or art. See Klubertanz, *The discursive power*, especially 206 ff., discussing Aquinas on *experimentum*. Leonardo’s definition probably had its ultimate source in the same texts to which Niccolò Leonceno was indebted, namely Aristotle’s discussion of medicine as a science in part practical, in part speculative (*Nicomachean Ethics* 1,112b15–25, 1,032b5–15; *Physics* 200a15–25).

sciences.¹⁰⁰ For similar reasons, Lorenzo Valla and other humanists writing in the mid-fifteenth century proposed joining eloquence with moral philosophy. New in Valla's argument was the positive value attached—not to difficult poetic allegory—but to ordinary language, devoid of technical Scholastic jargon, aimed at a universal audience.¹⁰¹ The issue of artifice enters into Leonardo's comparisons of the arts precisely in this connection, for he argues that painting, too, is a universal language.

Even more extensive connections can be established between Leonardo's arguments justifying pictorial artifice and historical debates about the value of literary artifice. A key issue dividing the earliest humanists and Scholastics over classifications of knowledge centered on Aquinas' interpretation of Aristotle's statement (at the beginning of the *Metaphysics*, 982b12) that "it is owing to their wonder that men now begin and first began to philosophize."¹⁰² Defenders of poetry claimed that Aristotle had meant that the artificially composed figurative language of poetry identified all poets positively with the first theologians, who created myths. Scholastics, on the other hand, followed Aquinas' view that myths induced by wonder cannot rationally answer questions about nature. "Poets lie" in the sense that the content of poetry does not offer logical explanations.¹⁰³ In contradistinction to early humanists, including Valla, Leonardo also claimed that poetry, because it depends on language, can never be universal; painting, on the other hand, is a universal language and a demonstrable science "of great discourse" (*Parte Prima*, Chapter 6). In effect, he responded to scholastic criticism of the arts of imitation in much the same way as late fifteenth-century humanists like Giorgio Valla, who created more powerful tools for rhetorical invention by incorporating mathematical terminology and propositional forms of argumentation from Scholastic logic.¹⁰⁴

¹⁰⁰ Petrarch's defense of poetry was set out in his *Invective contra medicum* (1352–1353). The last two books of Boccaccio's *Genealogia deorum gentilium* (Books 14 and 15), are known as his defense of poetry.

¹⁰¹ On Coluccio Salutati's defense of Leonardo Bruni's defense of correct translation and Valla's defense of rhetoric, see Seigel, *Rhetoric and Philosophy in Renaissance Humanism*, 63 ff. According to Seigl, 161, Valla relied on Quintilian in his commitment to common sense and ordinary natural language—arguments he directed specifically against Scholastics.

¹⁰² Greenfield, *Humanist and Scholastic Poetics*, 47 ff., with references to earlier studies by Kristeller.

¹⁰³ Compare Aquinas, *Commentary to the Metaphysics*, I. L.3: C52–68.

¹⁰⁴ See further discussion of Valla's *De expetendis et fugiendis rebus* in the introduction to the Commentary Notes on poetry.

Florentine Debates over the Status of Poetry

At first blush, Leonardo's polemical position that the fictions poets invent are mere lies may appear to resemble Savonarola's arguments against poetry. Yet the broader cultural contexts of their respective arguments are quite different: Savonarola preached reform to the masses by attacking humanist ideas of *theologica poetica*, while Leonardo's arguments, which only entertained a courtly audience, defended the very artifice that Savonarola condemned. Nonetheless, the vigor with which Florentines debated the value of poetry, especially in the final decade of Savonarola's ascendancy, constitutes a significant precedent and contemporary parallel to Leonardo's defense of painting.

Leonardo and Bernardino Bellincioni both came to Milan from the humanist circle of Lorenzo de' Medici in Florence, which maintained regular ties with the Milanese court, but only vague connections can be documented between Leonardo and Savonarola's attacks on the abuse of poetic artifice. Yet it is certain that Leonardo was familiar with Savonarola's Thomistic position, because he used the same arguments himself. Leonardo owned a copy of sermons by one of Savonarola's precursors, the early fifteenth-century preacher Bernardino da Siena, who also praised holy scripture by condemning pagan poetry, but the arguments about poetry and theology, pro and con, were so widely disseminated that Leonardo was probably familiar with them from other, even personal contacts.¹⁰⁵

Savonarola's *De divisione scientiarum* (1492), contributes to the same contemporary debate over the proper classification of knowledge as Giorgio Valla's scheme, mentioned above. In this work Savonarola included perspective among the sciences of the Quadri-vium, and he devoted a short treatise, entitled *Apologeticus*, to the proper classification of poetics.¹⁰⁶ The core of Savonarola's argument, delivered from the pulpit of San Marco in November 1490 before his treatise was published, concerns the value of poetic metaphor, a central issue in humanist defenses of poetry.¹⁰⁷ Like his predecessor Cardinal Giovanni Dominici, who disputed with

¹⁰⁵ Bernardino da Siena, *Le prediche volgari*, 237 ff., cited in Greenfield, *Humanist and Scholastic Poetics*, 246. In *Madrid Codex II*, ca. 1503–1505, Leonardo listed an edition of Bernardino's writings among the contents of his library: see Reti, ed., *The Madrid Codices*, 3: 96, n. 30.

¹⁰⁶ Girolamo Savonarola, *Apologeticus de ratione poeticae artis* (Pescia, 1492), revised edition in *Opus per utile de divisione ordine ac utilitate omnium in Scientiarum . . . in poetica artis*, Venice, 1534, published as *De divisione*, Florence, 1946, 807–824 (references are to this edition).

¹⁰⁷ On Savonarola's activities, see Weinstein, *Savonarola and Florence*, 74–77, 104; Meltzoff, *Botticelli, Signorelli, and Savonarola*, 35–36.

Salutati and other humanists at the beginning of the century, Savonarola attacked allegorical interpretations of poetry by arguing that only scripture has truly allegorical meanings. Following Thomas Aquinas, Savonarola defined the purpose of poetry as the inducing of virtue through the imaginative representation of concrete images.¹⁰⁸ Since poetry is a human product, poetical metaphor must be interpreted literally. In scripture, figured language presents true events; poets, in contrast, use ornament to veil weak arguments with fiction.

In Florence during the last decades of the Quattrocento, the value of literary artifice was ardently debated. One of the most important Florentine contributions to humanist studies was Cristoforo Landino's 1474 *Disputationes Camaldulenses*, which explained a method of extracting truth from the figured language of poetry.¹⁰⁹ Here, and again in the preface to his 1481 commentary on Dante's *Commedia*, Landino used scientific, philological methods to defend the ability of both pagan and Christian poets to reveal divine mysteries.

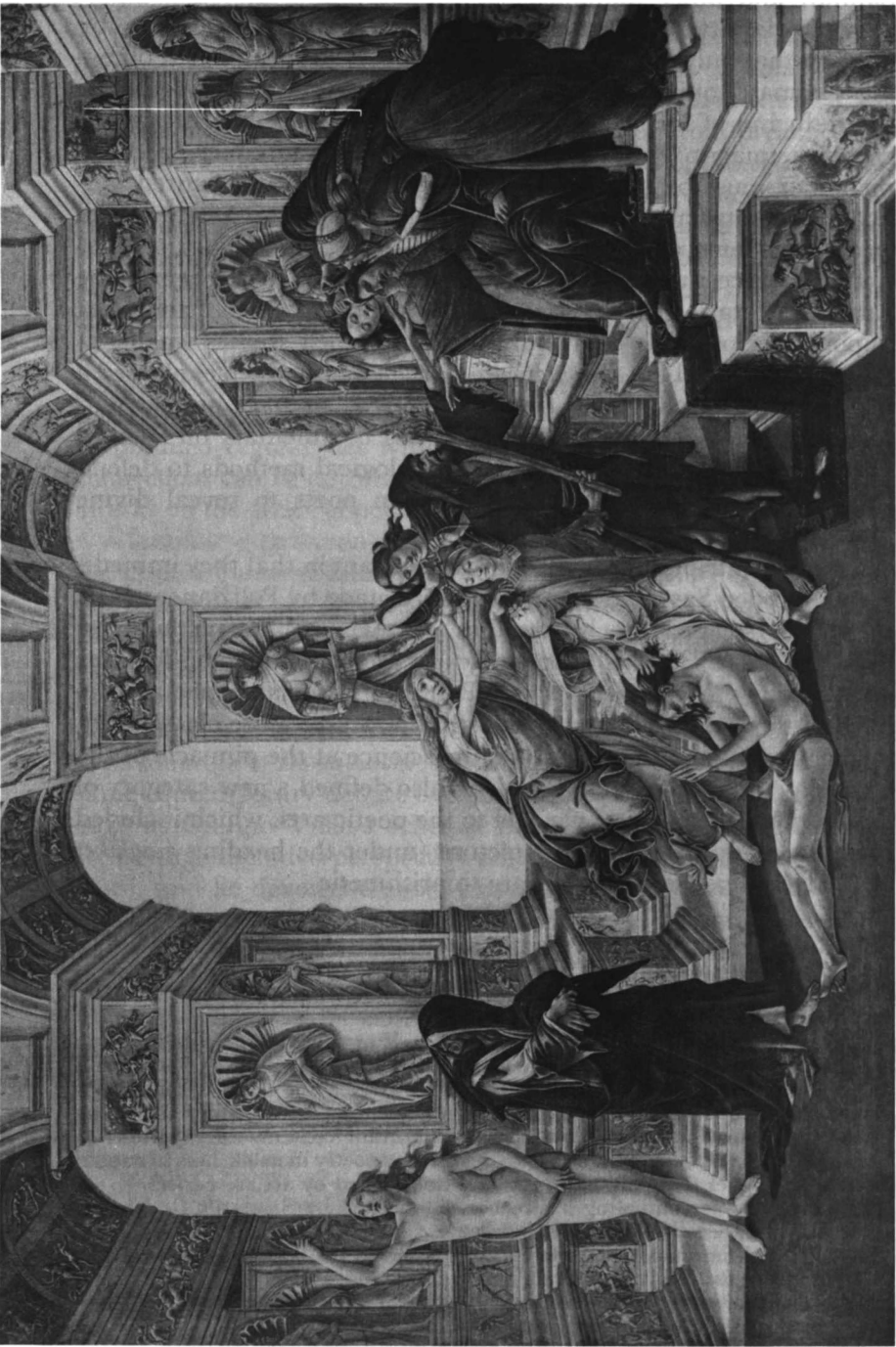
Similar contributions, even more significant in that they immediately preceded Savonarola's attack, were made by Poliziano, whose theory is steeped in his studies of Aristotelian methods of demonstration.¹¹⁰ In his *Panepistemon*, an introduction to his lectures on Aristotle's *Nicomachean Ethics*, Poliziano associated poetry (defined in the broad sense to include all literature) more closely with theology, defining it as a semi-divine science at the pinnacle of the hierarchy of knowledge.¹¹¹ Poliziano also defined a new category of the mechanical sciences, parallel to the poetic arts, which included painting, sculpture, and architecture (under the heading *graphike*) as physical sciences subalternate to arithmetic.

¹⁰⁸ Savonarola, *De divisione*, 822–824. Savonarola's classification of poetry has been discussed most fully by Chiti, *L'estetica del Savonarola*, especially 58 ff.; and Greenfield, *Humanist and Scholastic Poetics*, 246–256. Many of Savonarola's arguments are traditional, and were already collected in encyclopedic review by Boccaccio in Books 14 and 15 of *Geneologia deorum gentilium*, his defense of poetry composed between 1350 and 1362. Chiti, *L'estetica del Savonarola*, 50–51, in a discussion of Savonarola's objections to artifice (which she notes is contrary to views expressed by Leonardo), cites an argument of 1497 worth consulting because its tone and content provide an important contemporary parallel to Leonardo's defense of painting as an art superior to poetry in its likeness to nature. Savonarola argues that only natural things not created by art are perfect.

¹⁰⁹ Landino was continuing a direction established by Salutati's *De laboribus Hercules* (1406). See Trinkaus, *In Our Image and Likeness*, especially 2: 683–721 on *theologia poetica*, for an overview of humanist issues in the later fifteenth century.

¹¹⁰ Meltzoff, *Botticelli, Signorelli and Savonarola*, 21–36, argues that Poliziano and Savonarola were engaged in a debate.

¹¹¹ See discussion of the *Panepistemon* at CN 2.



Ill. 10. Sandro Botticelli. *The Calumny of Apelles*. 1497 – 1498(?). Panel. Florence, Uffizi.

Savonarola's sermons on the abuses of poetry a few months later were perhaps directly inspired by Poliziano's treatise. Savonarola upheld the orthodox position established by Aquinas: poetry forms the bottom rung of the rational sciences, classified according to their degree of demonstrability, because it uses the *exemplum*, a method of proof that concerns two particulars. Classifying poetry on the basis of its subject matter would throw the entire system of the sciences into chaos.¹¹² Less than two months after the publication of Savonarola's treatise, in a letter addressed to the astronomer Paul of Middleburg, Ficino proposed an unprecedented classification of painting, sculpture, and architecture among the liberal arts, along with music and the poetic arts.¹¹³ Poliziano, in turn, defended philosophy on his own terms, in the *Lamia*, an introduction to his lectures on Aristotle's *Prior Analytics* in 1492.¹¹⁴ At his death in 1494, Poliziano was still studying Aristotle's writings on method, translating from the Greek (which he learned from Ermolao Barbaro) the *Posterior Analytics* and the *Topics*, the subjects of his lectures that year.

We do not now have enough information to determine how Florentine painters or sculptors might have contributed to these ongoing literary debates. However, it is tempting to identify exceptions. A direct visual parallel to Leonardo's invectives in that it involves a defense of painting has recently been suggested by Stanley Meltzoff, who argues that Botticelli's *Calumny of Apelles* was a direct retort to Savonarola (Figure 10).¹¹⁵ According to the

¹¹² Greenfield, *Humanist and Scholastic Poetics*, 251. Savonarola, like Thomas Aquinas, defined poetry as inducing virtue by delighting the soul through a concrete image, that is, a particular representation, the function of which is to: "Finis autem poetae est inducere homines ad aliquod virtuosum per aliquam decentem repraesentationem" (to induce man to virtue through some convenient representation; *De divisione*, 808; translation cited from Greenfield, 249). Compare also Boethius, *De topicis differentiis*, 1184A35–1184D5. Savonarola's discussion of a particular representation, or *exemplum*, as a form of induction (based on Aristotle, *Prior Analytics*, 68b38–69a19), agrees closely with Thomas Aquinas (*Commentary to the Posterior Analytics I*, L. I, 14.). For a different view, see Greenfield, 249.

¹¹³ See Kristeller, *Marsilio Ficino*, 22 (the text is reprinted in Ficino, *Opera omnia*, 944). This classification is somewhat older, however: Panofsky, *Renaissance and Renascences*, 16, credits Lorenzo Valla with inventing the triad in *Elegantiae linguae latinae*, written between 1435 and 1444, an edition of which Leonardo may have owned: see Reti, ed., *The Madrid Codices*, 3: 104, n. 85. Kristeller, 17, also cites Ficino's 1463 classification of the arts in his introduction to the works of Hermes Trismegistrus.

¹¹⁴ See Meltzoff, *Botticelli, Signorelli and Savonarola*, 58–63. On Poliziano's revolutionary methodological innovations in textual criticism, see Grafton, "On the Scholarship of Politian and its Context."

¹¹⁵ Meltzoff, *Botticelli, Signorelli and Savonarola*, 89–94. Botticelli's *Calumny* includes a loggia filled with sculpted reliefs in the ancient tradition of Philostrates' *Imagines* so popular in chivalric romances from the *Roman de la Rose* to Poliziano's

ancient story told both by Lucian and Pliny, Apelles painted an allegory of calumny in response to fellow artists who envied his artistic success.¹¹⁶ The *Calumny of Apelles* is, in fact, one of the *ekphraseis* described in ancient literary sources most frequently commissioned from Renaissance artists.¹¹⁷ Leonardo himself referred to the subject at least twice in the *Parte Prima* arguments, in passages that suggest that his immediate source was Alberti's treatise on painting.¹¹⁸ Alberti cited Lucian's version as evidence of how painters could benefit from literary inventions.¹¹⁹ Botticelli's painting is without doubt an erudite comment on the value of poetic metaphor to the art of painting.

Although Meltzoff's interpretation of the *Calumny* is conjectural, lacking supporting historical evidence, his account suggests how comparisons of the visual arts developed in connection with defenses of poetry, not only at the Milanese court but also in Florence, and how both topics in both places revolved around the value of artistic ornament. Even though Leonardo developed similar arguments on somewhat different grounds (he never classified painting as a poetic art and he ridiculed the *furor poeticus* these Florentine neoplatonists prized), he also defined the nobility of painting in terms of its ability to compete with poetic allegory and other forms of literary artifice.

La Giostra. The story of Apelles introduced a moralizing tale about the philosopher Demetrius and King Ptolemy. Savonarola's *Apologeticus* ends with Eusebius' version of a moralizing tale featuring the same two protagonists, about the sacrilege committed when poets treat scripture. Meltzoff has suggested that Poliziano, with assistance from Ficino, planned Botticelli's pictorial scheme to include references that would instruct Piero de' Medici to ignore Savonarola's argument. M. Kemp in his review of Meltzoff (*Times Literary Supplement*), notes the difficulties of connecting Botticelli's painting specifically with contemporary debates about the merits of *theologia poetica*. I thank Martin Kemp for calling his review and Meltzoff's study to my attention.

¹¹⁶ See Cast, *The Calumny of Apelles*, for the most complete history of Renaissance versions. When King Ptolemy vindicated Apelles, the painter painted an allegory magnifying the commandment against bearing false witness. Apelles' defense of painting took place before a judging king.

¹¹⁷ Marek, *Ekphrasis und Herrscherallegorie*, 6–8, 157; Marek connects these representations with "studioli" owned by learned humanists, for whom the paintings often functioned as erudite visual panegyrics. Marek, 79–90, 158–159, also refers this tradition to Leonardo's drawing known as "Quos ego," based on Virgil's *Aeneid* (I, 124–147), a passage that was in the Renaissance regarded as a "painting in words."

¹¹⁸ *Parte Prima*, Chapters 19 and 21: see commentary *sub numero*. The subject was popular with artists of Leonardo's acquaintance: Filarete, a source Leonardo knew, also borrowed Alberti's account (Cast, *The Calumny of Apelles*, 19–27); and Cast, 52–53, suggests that the *Calumny* is also the subject of a relief by Francesco di Giorgio, ca. 1475.

¹¹⁹ Alberti, *On Painting*, 3: 53.

The Nature of Nobility

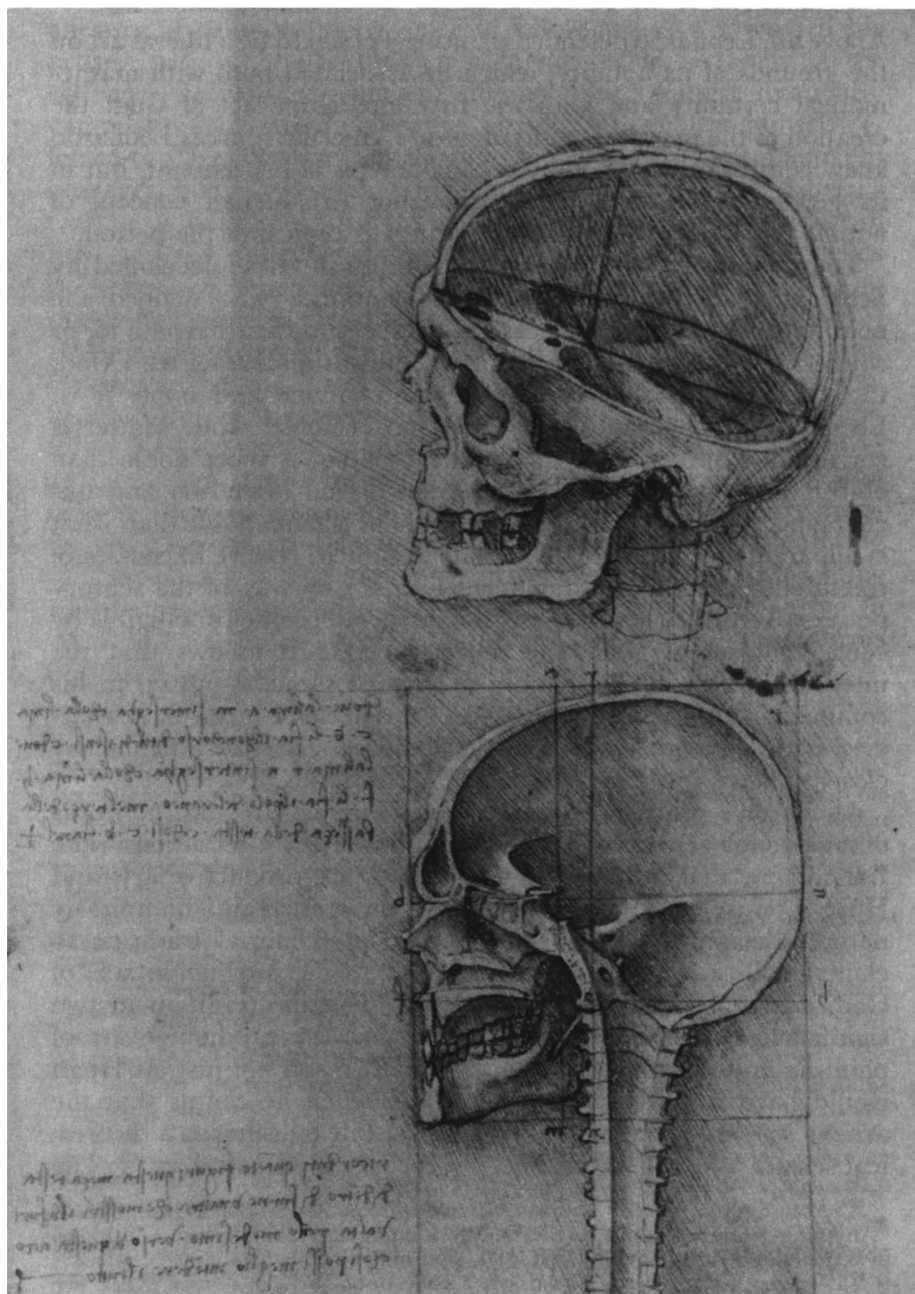
Above all, Leonardo defended painting's claim to be a liberal art on the grounds of its nobility, which he associated both with mathematical certainty and with the first intelligible act of God: the creation of the material world of nature. Specific sources Leonardo knew contribute to the individual character of his thought, but in its general outlines, the neoplatonizing Aristotelian concept of nobility developed by Scholastic writers is typical of the period.

Leonardo frequently referred to nobility in terms developed by Scholastic writers such as Thomas Aquinas, who defined the nobility of material substances with respect to their likeness to, or connection with, God. The more an entity is in contact with God, the "first intelligible object," the more divine and noble it is. Leonardo would argue that since God is noble, while matter is corruptible, nature, created directly by God, is more noble than objects fashioned by man. Again, since God is eternal and unchanging, what is essential and permanent is more noble than what is apparent and variable. Material substances receive likenesses of the intelligible (called "intelligent forms") by way of the sensory powers. According to Aristotle, the intellect becomes intelligible by conceiving some intelligible object, and so it follows that the intellect and its intelligible object are the same. Aquinas, in his commentary on the *Metaphysics*, read Aristotle to mean that whatever is divine and noble to a higher degree has this attribute by closer contact with God's actual understanding.¹²⁰

Leonardo's contrast between the works of nature and the works of man stems generally from Hugh of St. Victor's definition in the *Didascalicon*, that the mechanical sciences are productive arts and Hugh's praise for the inventiveness of the craftsman who imitates nature. Leonardo follows this widespread medieval tradition to claim nobility for the artist by analogy to the intelligible acts of God, *deus artifex*, but he departs from the same tradition in two significant respects: when he claims that the productive art of painting imitates the appearances of nature and not just, as Hugh would have it, nature's processes, and when he claims that the artist's *ingegno*, or powers of invention, define painting as a theoretical science and not simply as a productive, mechanical art.¹²¹ The

¹²⁰ According to Thomas Aquinas, *Commentary on the Metaphysics* XII.L8: C2543: "Anything divine and noble, such as understanding and taking pleasure, is found in a much higher degree in the first intelligible object with which it is in contact."

¹²¹ On the medieval and Renaissance conception of God as *deus artifex*, see Cahn, *Masterpieces*, 23–42; Panofsky, *Idea*; Ovitt, *The Restoration of Perfection*, 57–87. The latter claim was made by Poliziano, for example; on issues related to the productive arts, see CNs 13, 23, 28, and 33.



Ill. 11. Leonardo da Vinci. Two views of the skull. c. 1489. Pen and ink over black chalk. Windsor, Royal Library W19057 recto.

first claim for the status of painting is grounded in optical theory; the second claim, echoed in other contemporary appreciations for the new mechanical or productive sciences theoretically founded on mathematics, is based on a definition of science as both theoretical and practical.

Aquinas, borrowing from Aristotle's *De anima*, maintained that just as light manifests itself to the eye as color, the intelligible manifests itself to the intellect as phantasms or mental images.¹²² Elaborating upon an ontological hierarchy at least as old as Plato's dialogues, Aquinas claimed that sight is the most noble sense because it requires only spiritual change; by contrast, hearing, second in nobility, also requires the "natural" change of percussion or commotion.¹²³ Discussing the issue of discourse in the natural sciences, in his commentary on Boethius' *De Trinitate*, Aquinas compared the imaginary figures of mathematics to phantasms or images apprehended by the senses: both are produced by the same internal sense of the imagination.¹²⁴

Scholastic ideas about nobility pervade Leonardo's discussions of artistic imitation, although he often interpreted his sources in a surprisingly literal fashion—for instance when he tried to locate the exact position and function of the judging power of the soul, the internal sense of the *sensus communis*, as recorded in 1489 in a beautiful series of stereometric cross-section drawings of the skull (see for example, Figure 11).¹²⁵ Similarly, he conceived of the imagination in mechanistic terms, as a mirror, except that in this case so did a number of Scholastic writers following Avicenna's theory of vision, which combines a mathematical theory of optics with Galen's anatomy of the eye. Dante, in a passage of the *Convivio*

¹²² On the necessity of mental images, see Aquinas, *Summa Theologiae*, 1a.84.art.6–7. See further discussion in Chapter Three, and CNs 8, 13, and 14.

¹²³ According to Aquinas, *Summa Theologiae*, 1a.78.art.3. reply: "Now sight, because it does not involve physical change on the part of either object or organ is the most spiritual, the highest of the senses, with the widest range of objects" (ed. Blackfriars, 11:33). On the primacy of sight, see Summers, *The Judgment of Sense*, 32–42.

¹²⁴ Thomas Aquinas, *Expositio super Librum Boethii de Trinitate*, Qu. 6, art. 1.4, resp. to obj. 1, where Aquinas compares natural science to theology, both of which concern opinion rather than certitude, which is found only through mathematical demonstration.

¹²⁵ See M. Kemp, "'Il concetto dell'anima' in Leonardo's Early Skull Studies." As Kemp, 118–119, notes, the association of the *sensus communis* with a ventricle of the brain derives from a "misinterpretation" of Aristotle's characterization of the "common sense" as an abstract, discriminative power, in the *De anima* (3, 2). On Leonardo's notions of the *sensus communis* see Summers, *The Judgment of Sense*, 71–90. For the drawings, see New York, Metropolitan Museum of Art, *Leonardo da Vinci: Anatomical Drawings from the Royal Library*.

based directly on Thomas Aquinas, described the passage of images through the optic nerve as a *discorso* in which the images are constantly transmuted according to the properties of vision.¹²⁶ Dante's arguments hinge on the important distinction between the transmutable, sensitive mind and the immutable intellective mind: one is concerned with particular visible images, and the other with principles, essence. Leonardo, describing the imagination in similar terms, conceived of painters as being able to "transmute" themselves into the mind of nature by making their *ingegni* like the surface of a mirror, which contains the similitude of whatever object is placed before it, and to use their *ingegni* to "discourse" about the properties of observed nature.¹²⁷ His conception of *disegno* is fundamentally indebted to the related idea that the "mental accidents" in painters' imaginations correspond to the movements of the figures they depict.¹²⁸

Leonardo argued that the nobility of painting is due to the painter's speculations about the causes of nature, the eternal aspect of created things or formed matter. Painters study nature, he maintained, by analyzing the properties of natural appearances, the "accidents" of nature, and synthesizing from them new images formed in the *fantasia* or imagination by combining memory, present experience, and knowledge of nature's eternal, causing principles. "Harmonic proportionality," which Leonardo sometimes identified with the geometric proportions of perspective, is "divine"

¹²⁶ On Dante, see CNs 2, 8, 38. According to Dante's modern editors, his views follow Avicenna's commentary on Galen (see *Il Convivio*, 3.9.8), a commentary also used by Aquinas; see edition of Busnelli and Vandelli, 1: 367, n. 5. Leonardo quoted another part of the *Convivio*, the third canzone, lines 52–53 of the third stanza, in *Ms. A*, fol. 113r (see CN 2). (This well-known passage was first discussed in the scholarship by von Schlosser, *La letteratura artistica*, 183.) Dante's commentary to this text concerns the opposition between "vile" and "noble" with reference to the degeneration of corruptible matter. Leonardo quotes the lines in which Dante writes that the painter could not paint a thing if first his *fantasia* did not have the capacity to conceive the incorruptible form of it. Notably, the source of Dante's text in the last two lines of the same stanza, where the word *discorrimento* occurs, is Aquinas, *Summa Contra Gentiles*, 1. cap. 1, where Aquinas writes that the desire for wisdom is the first principle of medicine and other examinations (*disserere*). Dante, *Il Convivio*, 2: 66–68 states that the Peripatetics perfected the Socratic mode of disputation "by their *ingegno* and almost divine nature" because they valued "deambulatori." Dante's use of the word *ingegno* and his discussion of modes of discourse is an early and perhaps direct precedent for the way in which Leonardo uses the word *ingegno* to mean an inborn faculty that can learn to discourse (see *Parte Prima*, Chapter 38).

¹²⁷ On the terms *ingegno*, *fantasia*, *imagination*, see *Parte Prima*, Chapters 2, 14, and 39, and notes *sub numero*.

¹²⁸ On "mental accidents" and Leonardo's pictorial procedures, see the classic essay by Gombrich, "Leonardo's Method for Working Out Compositions."

or noble in this respect.¹²⁹ Leonardo's use of the word "accident" originates in Aristotle's ten classes of predicates (*Categories* 1b25 and *Topics* 100a25 ff), though his immediate source was more likely optical treatises.¹³⁰ Nonessential properties of things in nature (like light and shadow) only happen (*accidet*) to be true of existing things: hence they are called "accidents." Leonardo gradually came to define a science of optics concerned exclusively with pictorial relief, which he named *chiaro e scuro*, an investigation capable of "gran discorso" that studies the visual effects of light and shadow, color, and atmosphere, all the accidents of nature which pertain to the functions of the eye.¹³¹ In Chapter 38 of the *Parte Prima*, he coined the felicitous phrase "accidentale arte."

Leonardo's definition of *discorsi* or "functions of vision," which he sometimes described as the ornament and beauty of the world, is also indebted to Alhazen's discussion of the composition of beauty as the "perfection of being" and "proportionality" or "consonance among particular intentions." It is not that there is any literal correspondence among texts; rather, Alhazen's treatise on optics provides a broader context for understanding the conceptual language in which Leonardo formulated his ideas. Knowledge of beauty, according to Alhazen, involves a complex operation of the intellect, which rationally calculates or measures the proportions of the "visible intentions" inherent in the thing seen and comprehended at one time (as in the conjunction of diverse parts of a face, which make a beautiful whole when similar proportions are collected together). Alhazen's followers, like Witelo (whose treatise on optics Leonardo mentioned in several places) elaborated on this description by assessing beauty critically, thus providing a link between the scientific and rhetorical traditions Leonardo synthesized. Witelo used criteria that ultimately derive from the same rhetorical sources that influenced Alberti's treatise on painting—as suggested by Witelo's praise of beauty glimpsed in the configurations of separate and distinct stars, like candles, shining in the midst of darkness, and shadows that subtly smooth the rough patches (*maculae*) seen in light.¹³²

¹²⁹ Leonardo's appreciation of "divine proportion" was ultimately indebted to Aristotle's discussion of design or composition in *De partibus animalium* (439 ff.). See discussion at CNs 33 and 34.

¹³⁰ See further discussion at CN 13 and Chapter Three. Leonardo uses the term (in a derogatory play on words) in *Parte Prima*, Chapters 28 and 42, with reference to poetry and sculpture, respectively. On his usage compared to Alberti's, see CNs 20 and 32.

¹³¹ *Parte Prima*, Chapter 6; see commentary, *sub numero*. Leonardo's definition of painting is the subject of Chapter Three.

¹³² Alhazen, *Opticae thesaurus*, Book 2, 59–60; Witelo, *De opticae*, 4: 148. On

Leonardo's notions of discourse are related to a broad history of loosely associated ideas concerning the respective roles of propositional argumentation and images in the process of coming to knowledge. At the foundation of this history is Plato's association, on the basis of their shared concern with images, of scientific knowledge, *dianoia*, and opinion, *eikasia*, "the power of making shadows or framing conjectures."¹³³ According to Plato's discussion in the *Republic* (524 A), the imagination of ideas proceeds by means of dianoetic images only in the case of science. Scientists use "true imagination," but since they make use of hypotheses as principles, they do not ascend to first principles as dialectic knowledge does. Like Plato, Aristotle likened the process of coming to knowledge to mathematical study involving the use of images. Aristotle described recollection as a process in which memory functions, by a kind of inference which takes place in the material part of the mind. The mind reaches outwards to things by a "proportionate mental movement" analogous to the way spatial magnitudes are discerned and described formally on the model of a universal demonstration of the similarity of triangles.¹³⁴ Proof proceeds from one mathematical image to another in natural succession: recollection is therefore a search for a mental picture set in motion in the part of the mind where affection resides.

Medieval discussions of the associations between images and discursive reason (described on the syllogistic model of an inference), suggest that Leonardo was consciously synthesizing theoretical opposites when he maintained that images were in fact a means of contained discourse.

Theorem 148, see also Witelo, *Teorema della bellezza*. Alhazen's "visible intentions" ultimately derive from Aristotle's predicables; see Summers, *The Judgment of Sense*, 153 ff.

¹³³ On Plato, see Bundy, *The Theory of Imagination*; the following quotations are cited from Bundy's text. In *The Republic* (524–525), Plato distinguished four faculties of the soul on the basis of their kinds of operations. In the *Philebus* and the *Timaeus*, Plato discussed the function of opinion on the basis of the science of ethics. True opinion comes into our souls as memory, and there resides in the imagination "a painter who, after the scribe has done his work, draws images in the soul of the things he has described" (*Philebus* 39A). Thus, phantasy or imagination regulates future conduct by offering a concrete presentation of opinion which, according to *Timaeus* (51E, 52A), acts like a mirror because it "receives likenesses of the power of thought and gives them back to sight." Therefore, the products of phantasy reflect the higher idea in a concrete, individual thing of beauty, a perfect object of vision, which is higher than any activity of discursive thought (compare the similar formulation in *Phaedrus* 250).

¹³⁴ *De memoria et reminiscencia*, 451b ff. (452b12 is cited from *The Basic Works of Aristotle*, 615).

The Issue of Method

Although Leonardo's polemics and his definitions of painting employ different kinds of argumentation—one is a *vituperatio*, the form of epideictic rhetoric concerned with blame, and the other, which begins by defining terms, is a form used to set out a subject for study by means of diaphysis—they have in common the subject of method. In large measure the problem of finding proper methods for arriving at certain knowledge, on the premise that the mathematical sciences are the most noble, is the key to Leonardo's defense of fictive images as artifice grounded in truth.

In Italian universities, scientific methods used in the natural sciences had been in a state of flux and disagreement since the early fourteenth century.¹³⁵ The discussions can be traced back through various medieval commentators to Aristotle and to the second-century physician Galen. Aristotle, transferring ancient Greek methods of mathematical demonstration to discussions of method in the natural sciences, described a method that became known as the "double procedure" (induction/deduction), the analysis of effects into their causes and causes into their effects.¹³⁶ He also described certain sciences, like optics, harmonics, and astronomy, as being in part mathematical and in part physical—an idea further developed by Galen and his medieval commentators, such as Avicenna, who elaborated on this conception and developed the distinction between theory and practice in various ways.

One of the earliest references to the double procedure in Leonardo's writings is the letter drafted to the overseers of the Milan Cathedral

¹³⁵ Randall argues that during the fifteenth century the issue of proper method was essential to the definition of any science that combined mathematical theory with experience; see "The Development of Scientific Method in the School of Padua," 186, and also 192, where Randall mentions Agostino Nifo's commentary on the *Physics* (1506) as the fullest account of Galen's three kinds of demonstration (inductive, deductive, and by definition) associated with this "double procedure." See also Randall's "Paduan Aristotelianism Reconsidered." For the medieval and early Renaissance Scholastic terminology of *compositio-resolutio*, see also Dolan, "Resolution and Composition in Speculative and Practical Discourse."

¹³⁶ See discussion at CNs 33 and 34. N. Gilbert, *Renaissance Concepts of Method*, 3–38, the only overview of the subject, further notes, 48–49, that the Latinized form *methodus* never caught on and, instead, the Greek was translated by a variety of words—a circumstance contributing to the confusion in the transmission of sources which Gilbert attributes largely to Cicero. Cicero's specific translations, as *via* and *ratio*, as well as his general example of finding various equivalents, were followed by ancient and medieval writers. The best historical overview of how the classical methodology of demonstrative proof was gradually altered to a science of induction and experimental investigation is still Crombie, *Medieval and Early Modern Science*; see also Clagett, "Some Novel Trends in the Science of the Fourteenth Century."

around 1490, on CA 270 r–c. Leonardo's translation of Pecham's definition of optics, also written around 1490 (CA 203 r–a), provides a textual source for his knowledge and a second reference to the "double procedure." The passage, in Leonardo's translation, describes perspective as a science that exalts the *ingiegni* of investigators with demonstrations "founded both physically and mathematically" that "proceed sometimes by inferring [*conchiudendo*] effects from causes, and sometimes causes from effects."¹³⁷ The most mature version of his definition of painting as a science is preserved in the first six chapters of the *Codex Urbinas*, which form a consecutive argument beginning from the first principles of mathematics and concluding with definitions of the elements of painting, derived from demonstrated principles.¹³⁸ Features such as the double movement of argument between cause and effect, the use of geometric analysis, the treatment of differentiating characteristics of the whole and its parts, and the statement of the results of demonstration by definition identify Leonardo's argument with contemporary Aristotelian methods for ordering the operations of an investigative science like medicine, which is based on both theory and experience.¹³⁹

Several of Leonardo's passages on method echo both the ideas and the style of Galen. Although his exact sources have not been unequivocally identified, Leonardo knew anatomical writings in

¹³⁷ Kemp, "Leonardo and the Visual Pyramid," 233, suggested that Fazio Cardano, a Milanese acquaintance of Leonardo's who edited the first edition of the *Perspectiva communis* (Milan: Petrus de Corneno, 1481–1483?), could have assisted Leonardo's translation. Leonardo's source in Pecham and his acquaintance with Cardano were first noted by Solmi, *Le fonti dei manoscritti*, 226–227. See also Pedretti, *Commentary* to R.13 (CA 203 r–a). See Leonardo's source in Pecham, *John Pecham and the Science of Optics*, 60–61.

¹³⁸ These chapters have direct precedents in three drafts preserved in the *Madrid Codex II*: see discussion in Chapter Three. Leonardo's use of the double method has been relatively unstudied, but see "Il concetto dell'anima" in Leonardo's *Early Skull Studies*, especially 132, and *Leonardo da Vinci*, 161; see also Strong, *Leonardo on the Eye*, 254–280. Another significant passage that combines these features of argumentation, and moreover suggests how Leonardo planned to organize a treatise on anatomy according to these features, is W. 19,037 verso (*Anatomical Ms. B*, fol. 20 verso [R. 797], ca. 1498 and 1508 (on the dating, see Pedretti, *Commentary*, 1977, *sub numero*).

¹³⁹ Many documents of the controversy over method were first printed in the 1480s, and Leonardo probably owned at least one of the most important publications: Randall, "Scientific Method in the School of Padua," 282, notes that in 1496 Albertus of Saxony's *Tractatus de proportionibus* was published together with Walter Burleigh's *De intentione et remissione formarum*, a volume which corresponds to an item Leonardo recorded in the *Madrid Codex* booklist, according to Reti, *The Madrid Codices*, 3: 93, n. 10. See N. Gilbert, *Renaissance Concepts of Method*, 82 ff., for late fifteenth century features of the double method and increasing efforts to quantify these procedures.

the Galenic tradition by about 1488, and at least one passage he echoes was known to the late Quattrocento directly and indirectly in several forms.¹⁴⁰ In the "Proemio series," a cluster of fragments dated ca. 1490–1492 compiled in the *Codex Atlanticus*, he seems to have consciously imitated Galen's style of mixing praise for the beauty and truth of nature with castigations against those ignorant of proper method in the natural sciences. Leonardo's contrast of "inventors and interpreters between Nature and Man" with charlatans who merely quote other authors, going about "puffed up and pompous, dressed and decorated with the fruits of the labors of others, not their own" (CA 117 r–b and 119 v–a) corresponds closely with an invective formula used by Galen in a well-known discussion of method at the end of Chapter 6 of the *Ars parva*. Galen defined medicine as a productive art based on science, in part deductive and in part inductive, derived from experience—in short, what Aquinas would later call a *scientia media*.¹⁴¹

¹⁴⁰ Among his personal acquaintances in Milan, two possible sources for Leonardo's knowledge of methodology in the natural sciences are the Pavian mathematician and physician Giovanni Marliani, whose *Tractatus de proportionibus*, c. 1482, developed connections between natural causes and mathematical formulae (Paul Rose, "Giovanni Marliani"); and the jurist Fazio Cardani, translator of Pecham's *Perspectiva communis* (see n. 137). Marliani died shortly after Leonardo arrived in Milan, but apparently Leonardo had access to the scientist's library through his two sons, who were also members of the faculty at the University of Milan, because a memorandum of ca. 1492 (CA 222a) refers to borrowing books on algebra and anatomy, a manuscript by Witelo, a treatise entitled *De ponderibus*, and other books in their possession. I thank Jennifer Rashleigh for calling my attention to these sources. See M. Kemp, "Il concetto dell'anima," 119. On Leonardo's debt to Galen, see M. Kemp, "Dissection and Divinity in Leonardo's Late Anatomies," and in connection with his possible relationship to the anatomist Marcantonio della Torre, see most recently Kemp, *Leonardo da Vinci*, 285. Editions of the *Articella* were published in Padua, ca. 1476, and Venice, 1483, and Torrigiano di Torrigiani's commentary, *Plusquam commentum in microtegni Galeni* was published in Bologna, 1489. It has been suggested that Leonardo might have known a Milanese edition of Galen's *De Constitutione artis medicae* published by L. Pachel in 1483 or 1484, or Giorgio Valla's Latin translation of the *De Medicinæ principis*, completed by 1484 (Gukovskij, "Leonardo e Galeno"). I thank John Scarborough for discussing with me the intricate history of fifteenth-century manuscripts and editions of Galen.

¹⁴¹ Galen, *Medicorum graecorum Opera quae extant*, 5: 244–245. Leonardo's intermediary source may have been Cecco d'Ascoli's *L'Acerba* (a book Leonardo owned), as Kemp "Dissection and Divinity in Leonardo's Late Anatomies," 216, n. 88, has suggested. For the idea that certain sciences are in part mathematical and in part physical, see Aristotle, *Physics* 194a–7–10; this idea was subsequently discussed in commentaries on the *Physics*. According to Gagné, "*Du Quadrivium aux scientiae mediae*," Aquinas was the first to use the term *scientia media*, in line with distinctions developed by Albertus Magnus as well as Robert Kilwardby. Discussions of the *scientiae mediae* extend into the sixteenth century (Gagné, 985–986). Galen's teaching was confounded with Aristotle in a textual tradition more complex than this brief reference to it can suggest. See discussion of Leonardo's

One passage in the “Proemio series,” CA 119 v–a, combines the invective form with an expository definition of optics along the line of Pecham’s preface to the *Perspectiva communis*.¹⁴² The ancients, Leonardo wrote, tried to define things that could not be proved, such as the nature of the soul, and “ignored or falsely believed” other things that could “at any time be clearly known and proved by experience.” The function of the eye, he noted, had “been defined by an infinite number of authors in one way; but I find, by experience, that it is another.” This “Proemio” suggests that Leonardo might have known the tenth book of *De usu partium*, which Galen introduces by inveighing against those “accuser[s] of Nature” who deny his theory of vision based on the nature of light.¹⁴³ Whatever his immediate source, Leonardo seems to have derived another polemic, Chapter 26 of the *Parte Prima*, from the discussion of the eye originating in Galen’s tenth book and again addressed to the subject of method. Leonardo derides philosophers who so value their inspired frenzies that they would wish to put out their own eyes. The corresponding invective by Galen is addressed to Sophists who believe that the motion of the eyelids is not under control of the will, and Galen, like Leonardo, derides disputants who think it is better to deceive than to confess their ignorance.¹⁴⁴ Employing Aristotle’s distinction between the artisan and the teacher (*Metaphysics* 981b) to emphasize the importance of theory to practice, Galen praised the artisan who could not only construct useful

knowledge of Galen, in Chapter Three; and CN 17, for discussion of method in relation to neo-Aristotelian distinctions between quantity and quality.

¹⁴² Pecham, *Perspectiva communis*, 60–61.

¹⁴³ Galen, *On the Usefulness of the Parts of the Body*, 2: 472 ff. Galen’s theory of vision is also presented in the *De placitis Hippocratis et Platonis* (7: 5). Leonardo spent many years investigating how the pupil dilates in response to light, one of the problems treated by Galen and other optical writers since Ptolemy, but his anatomical considerations of the eye show that probably he did not have direct access to the *De usu partium* in 1490, although he seems to have known it late in his life. Although the presence of Galen scholars at or near Milan and other evidence suggest that Leonardo was in touch with the vanguard of the medical profession in 1490, he is more likely to have had access to a greatly inferior abridgment of the *De usu partium* called *De iuuentis memborum* (see May, Introduction, *Galen on the Usefulness of the Parts of the Body* 1: 6–7). The first attempts to recover the Greek text began in the early fourteenth century; the first Latin translations began to be published in the late fifteenth century. Niccolò Leonicensi’s authoritative commentary first appeared in 1508; see Edwards, “Niccolò Leonicensi and the Origin of Humanist Discussions of Method.” The only overview of the relationship of artists to these texts is the recent contribution of Schultz, *Art and Anatomy in Renaissance Italy*. Given the complexity of the textual tradition, it would be worth investigating the forms in which the *De usu partium* was actually available to artists. M. Kemp, “Dissection and Divinity in Leonardo’s Late Anatomies,” is cautious about Leonardo’s access to Galen; see discussion of the problem at CN 34.

¹⁴⁴ Galen, *On the Usefulness of the Parts* 2: 485–486 (Book II, 84–85).

things such as a house but also explain how to construct the best house. When Leonardo defended painting as a mathematical science on the model of a *scientia media*, then, he was selecting a model grounded in both theory and experience, mathematics and physics.

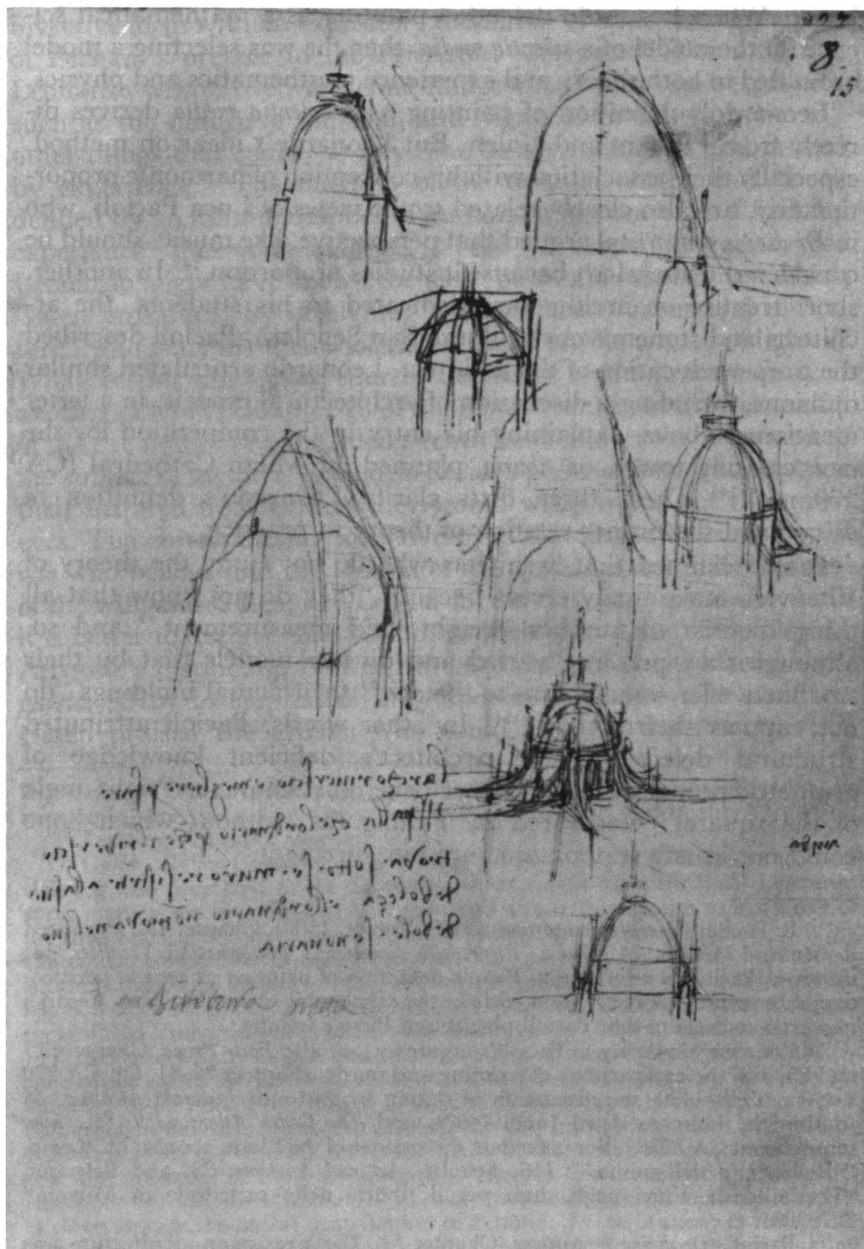
Leonardo's definition of painting as a *scientia media* derives directly from Pecham and Galen. But Leonardo's ideas on method, especially their association with his conception of harmonic proportionality, are also closely related to the views of Luca Pacioli, who in *De divina proportione* argued that perspective, like music, should be considered a liberal art because it studies proportion.¹⁴⁵ In another, short treatise on architecture dedicated to his students, the architects and stonemasons of Borgo San Sepolcro, Pacioli described the proper education of the architect. Leonardo articulated similar opinions, including a discussion of architectural models, in a letter mentioned above, explaining his entry in the competition for the new crossing tower, or *tiburio*, planned for Milan Cathedral (CA 270 r-c).¹⁴⁶ These three texts clarify Leonardo's definition of *disegno* and the proper relation of theory to practice.

Pacioli claimed that architects who do not study the theory of Vitruvius make many errors because "they do not know that all things consist of number, weight, and measurement," and so, although they present "varied and diverse models that by their smallness offer some charm to the eye," their actual buildings "do not support their weight."¹⁴⁷ In other words, Pacioli attributed structural defects to the architect's deficient knowledge of geometric proportion: to build well one must know the "right angle of the square," discovered by Pythagoras, without which "one could not in any way obtain sure measurement."

¹⁴⁵ L. Pacioli, *De divina proportione* (1498; Venice, 1509), Chapter III, excerpted in *Scritti*, 1: 63–65. M. Davis, *Piero della Francesca's Mathematical Treatises*, 11, discusses Pacioli in reference to Piero's definition of painting as part of perspective, a branch of geometry, and reviews the scholarship stemming from Vasari's (now mooted) claim that Pacioli plagiarized Piero's writing.

¹⁴⁶ For their similarity to Pacioli's argument, see also *Parte Prima*, Chapters 27 and 23, and the comparisons of painting and music, chapters 29–31. On CA 270 r-c, ca. 1488–1490, see discussion of dating by Pedretti, *Leonardo Architect*, 34 (dating the letter to April–June, 1490), and *The Codex Atlanticus* 2: 90 (now renumbered CA 730R). For precedent discussions of the *tiburio*, see also M. Kemp, "Il concetto dell'anima," 116, Schultz, *Art and Anatomy*, 73; and Beltrami, "Leonardo da Vinci negli studi per il tiburio della cattedrale di Milano," 327–386.

¹⁴⁷ Pacioli, *De divina proportione*, Chapter 54. The treatise on architecture was included in the same volume as *De divina proportione* and published under that title (Venice, 1509). This translation is cited from B. Rackusin, "The Architectural Theory of Luca Pacioli," 481. On the history of the manuscript, see Onians, *Bearers of Meaning*, 216.



III. 12. Leonardo da Vinci. Studies for the lantern tower of Milan Cathedral. *Codex Trivulzianus*, folio 8 recto. c. 1488–1490. Milan, Castello Sforzesco.

Pacioli's reference is probably to the introduction of Book IX of *De architectura*, where Vitruvius explained that mathematical problems involving incommensurable numbers could be solved by geometric methods and "drawing lines."¹⁴⁸ According to Vitruvius, Pythagoras discovered the principle for squaring the right triangle by means of drawing, with the knowledge of mathematical principles and "without the contrivances of artisans." For Pacioli, this example illustrated the proper relation between theory and practice. The Pythagorean triangle, the basis of the "golden section" or Greek "perfect number," was also the foundation for Pacioli's theory of "divine proportion," a ratio that is incommensurable by arithmetic means, but can be precisely worked out in rough sketches using a knowledge of geometry.¹⁴⁹

When he began to study mathematics with Pacioli around 1497, Leonardo turned immediately to problems of incommensurability, which became the focus of his geometric studies for the rest of his life; but earlier evidence of his interest in the subject of commensurability survives in connection with the project for the Milan *tiburio*.¹⁵⁰ Although his modello has not survived, from sketches preserved in the *Codex Trivulzianus* (Figure 12), we know that Leonardo made stereometric drawings that—while they indicate no actual measurements—are based on the proportional relationships of regular geometric solids. In line with medieval architectural practices, Leonardo worked out his design for the crossing tower in the fashion that Pacioli, following Vitruvius, would later recommend: if the geometry is based on true proportion, the actual structure will be sound.¹⁵¹ In his letter to the *deputati* of the Cathedral, on CA 270

¹⁴⁸ Compare Vitruvius, *The Ten Books on Architecture*, Book 9, Introduction (p. 252 ed. cit.).

¹⁴⁹ The Pythagorean principle of Pacioli's "divine proportion" is that a continuous proportion is generated when a line is divided so that the ratio of the smaller segment to the larger segment is proportional to the ratio of the larger segment to the whole ($A:B = B:C$).

¹⁵⁰ On his studies with Pacioli, see Marinoni, "Leonardo, Luca Pacioli e il 'De Ludo Geometrico,'" 292. Leonardo bought a copy of Pacioli's *Summa di Arithmetica*, Venice, 1494, even before they met. Pacioli not only instructed Leonardo from the *Summa*, but also translated passages from Latin for him: see most recently Marinoni, "La teoria di numeri frazionari nei manoscritti vinciani." Leonardo's studies of commensurability have been carefully analyzed by McCabe, "Leonardo da Vinci's *De Ludo Geometrico*."

¹⁵¹ As Kemp, "Il concetto dell'anima," 116, notes, Leonardo's argument that the architect must understand "the scientific laws of equilibrium" recalls the conception of *scientia* nearly ninety years earlier by Master Jean Mignot, whose statement about Milan cathedral also clarifies medieval practices: see Ackerman, "*Ars sine scientia nihil est*," 100–101. It is also worth noting that Leonardo might have been aware of structural problems that did not occur to Pacioli; a drawing in the *Codex Trivulzianus*, fol. 9 recto (Figure 12), which as might be expected does not

r-c, Leonardo claimed to satisfy the requirements for the new crossing tower "in part with reasons and in part with works, every time demonstrating effects by causes, every time affirming reasons with experience, in this way making use of the authority of ancient architects."

When Leonardo defined the difference between mathematical science and mechanics, as in *Ms. F*, fol. 59v, ca. 1508–09, he did so in Vitruvian terms. Recording his own solution to a classic problem of commensurability, the problem of Delos, he noted that Plato's proof was not geometrical because "it proceeds by instruments, the compass and the ruler, and experience does not allow it, but [mine] is mental and in consequence geometrical."¹⁵² For Leonardo, the theoretical sciences were based on scientific principles, while the mechanical sciences depended on compass and rule. Indeed, the distinction was so important to his thought generally that at the end of his life, when he planned a treatise on problems of squaring curvilinear areas, he eliminated the problem of squaring the circle evidently because all the solutions depended not on *disegno* but on the use of instruments.

Leonardo and Pacioli were at the center of a circle of artists who wrote about painting on the foundation of both mathematical principles and experience. Around 1502, Pacioli's associate Jacopo de' Barbari wrote a defense of painting similar to their claims. Jacopo, who probably painted the Naples portrait of Pacioli teaching Euclid, probably also studied mathematics with him.¹⁵³ Jacopo

include statical calculations, does include the following note: "I will reverse the arch, and it is better to make the support more than customary" (Larcho riverscio, e migliore per fare isspalla che lordinario perche il riverscio trova sotto se muro resistente alla sua debolezza ellordinario non trova nel suo debole se non aria). Transcription cited from *Il Codice di Leonardo da Vinci nella Biblioteca del Principe Trivulzio in Milano*.

¹⁵² The problem of Delos concerns squaring a volume and can be solved geometrically. The present discussion of Leonardo's views is based on McCabe, "Leonardo da Vinci's *De Ludo Geometrico*," 121 ff. On the history of the problem of rectifying the circle, see Heath, *A History of Greek Mathematics*, 220 ff. McCabe, 120–122, citing *Ms. F* fol. 59 verso, and other related statements, notes that Leonardo's treatise on problems of quadrature, proposed in 1515, was to be entitled "De ludo geometrico." Leonardo's opinion seems directly related to that of Vitruvius, who praised Pythagoras for demonstrating the principle of doubling incommensurable figures by geometric methods and drawing alone. Positive valuations of physical labor emerged in later, sixteenth-century arguments for the status of sculpture (see Chapter Four).

¹⁵³ Davis, *Piero della Francesca's Mathematical Treatises*, 67 ff., presents convincing literary and visual evidence for Jacopo's association with Pacioli. Davis interprets the painting attributed to Jacopo, now in the Museo Nazionale di Capodimonte, Naples, as a self-portrait with Pacioli teaching geometry from Euclid's *Elements*, Book 13, devoted to the five regular solids.

conflated recent optical theory with Aristotle's *De anima* to argue that painting is a "natura exanimata" because it studies the commensuration of proportions. That is, painters study the "species that pass through [the air] to the eye, and the nature of rays, in order to know how to place matters on the surface of the *tabule raxe*."¹⁵⁴ Leonardo's friend the Sienese artist Francesco di Giorgio Martini held similar convictions about the value of coupling experience with scientific knowledge and about the importance of drawing to conceptualization.¹⁵⁵ Leonardo acquired and annotated an early version of Francesco's treatise on architecture (*Ashburnham 361* in the Laurentian Library in Florence). But Francesco continued to rework his treatise over a long period, as is attested by variations among the many surviving copies of his manuscript.¹⁵⁶ The copy in the Biblioteca Nazionale in Florence (*Magliabecchiano II. I. 141*), which seems to be the latest version, includes several arguments, not included in the variant Leonardo owned, that nonetheless bear a striking resemblance to his comparisons of the arts. For his formulations of the distinction between theory and practice, Francesco, like Pacioli, seems to have been especially indebted to writings by Piero della Francesca, a major influence on Francesco's thought during his years in Urbino, which ended just before he met Leonardo in Pavia in 1490. Francesco also used interart analogies that link him with Vitruvius, Alberti, Gaffurio, and Pacioli, as well as Leonardo. He wrote, for example, that the architect needs to understand music because "music is necessary for the relationships and proportions of each building," and he extended to the architect commonplaces about the manner in which painters and sculptors have the same license to invent as poets.¹⁵⁷

¹⁵⁴ Jacopo's letter, dated between 1500–1502 by Kirn, "Friedrich der Weise und Jacopo de' Barbari," is reproduced in *Scritti*, 1: 66–70.

¹⁵⁵ Boscovitz, "Quello ch'è dipintore oggi dicono prospettiva," Parte 2, 141, notes that Francesco defined painting as a "factible" science. In terms Vitruvius would have approved, Francesco criticized architects who depend solely on Vitruvius' treatise and do not take experience into account. In his treatise on architecture, Filarete, another artist whose writings became known to Leonardo in Milan, expressed similar views (Rusk, "The Paragon of Leonardo da Vinci," 57 ff.).

¹⁵⁶ Onians, *Bearers of Meaning*, 171–181, on which the following discussion is partly based, reviews the evidence surrounding Francesco's contribution to architectural literature.

¹⁵⁷ Martini, *Trattati di architettura*, 2: 37–38. Francesco's analogy continues: "And when there is a dissonant note in music the whole tune is discordant, and the same happens in a building: it will be badly composed and discordant if all the elements do not correspond." Translation is cited from Onians, *Bearers of Meaning*, 181. This discussion is based on the same principle as Pacioli's argument, cited earlier in this chapter, that architectural models, like the finished building, must be well-proportioned to be structurally sound.

Francesco went beyond these well-known analogies, however, to nearly replicate some of Leonardo's most personal expressions concerning the advantages of images over words, for instance when he claimed that *disegno* is essential to the process of invention because it is difficult to understand things without drawings.¹⁵⁸ The innovative relationship between words and images that characterizes the later versions of his treatise implies that he, like Leonardo, was deeply impressed by the technical advances that made it possible to print illustrated books. Like Leonardo, Francesco was an autodidact whose intellectual horizons must have broadened greatly with the availability of printed books. Yet this process of self-education would also have presented new frustrations, especially when the information sought was in difficult languages like Latin, or highly polished vernacular prose. For these reasons, the addition of illustrations, charts, and tables (typical of early printed books) must have been welcomed by a wide new readership. Francesco, like Leonardo, claimed that drawings can represent ideas (*concetti*) to the imagination better than words because they appeal to the more noble sense of sight: drawings are useful in the explanation of ideas; visual examples will move the imagination more than words; sight will judge better than the sense of hearing.¹⁵⁹ Both artists, who were also friends, may have envisioned appealing to the rapidly growing market for illustrated texts. It may be, as John Onians suggests, that Francesco had in mind the newly published but unillustrated architectural treatises of Alberti (1485) and Vitruvius (1486) as models upon which he could improve.¹⁶⁰

But the similarities between Leonardo's and Francesco's arguments also have other intellectual sources. Indeed, both steeped themselves in the readily accessible scientific literature of the Aristotelian tradition, and both had an essential interest in Aristotelian method. For

¹⁵⁸ Martini, *Trattati di architettura*, 2: 505–506, cited by Onians, *Bearers of Meaning*, 173, who notes that this discussion, the conclusion to the whole treatise, exists only in the latest version. Compare the *Parte Prima* chapters defending painting against poetry. The argument corresponds most closely with Leonardo's latest comparisons of words and images, on pages such as *Quaderni anatomici VI*, fol. 22r (cited in Appendix 1), and CA 277va (discussed in CN 42).

¹⁵⁹ See Onians, *Bearers of Meaning*, 173, for these arguments in the second book of Francesco's treatise.

¹⁶⁰ Onians, *Bearers of Meaning*, 172. Onians also cites Roberto Valturio, *De re militari* (Verona, 1472), a book published in Italian as well as Latin that Leonardo owned and used to improve his knowledge of Latin vocabulary around 1487, as recorded in the *Codex Trivulzianus* (a thesis first advanced by Marinoni [1944]; see the summary of scholarship in, Leonardo da Vinci, *The Codex Trivulzianus*, ed. Brizio, 7–10; and in connection with his architectural theory, Pedretti, *Leonardo Architect*, 159 ff.).

example, as Onians has recently recognized, when Francesco described the value of including as *esempi* large drawings of fortresses with brief commentaries, he justified his method in Aristotelian terms. This discussion, and his attitude generally, are perfectly consistent with procedures recorded by Leonardo in various places, such as the end of *Ms. A*, ca. 1492, and many passages included in the *Parte Prima*:

Because every intellectual observation has its origin in sensation, as Aristotle testifies . . . and because among the senses that of sight is the most spiritual, pure, and perfect, and shows us more things and differences between things, it seems that our intellect is unable to understand anything or remember it for long if it has not perceived it with the sense of sight, or at least seen something like it . . . Hence, when all the general and special rules have been given, it is necessary to draw some examples, through which the intellect may more easily judge and with greater certainty remember; because examples affect the intellect more than general words, especially the intellect of those who are not very expert or learned.¹⁶¹

Discussions like these corroborate the impression made by Leonardo's own writings that his comparisons of the arts are motivated by a pervasive interest in Aristotelian method, specifically the proper relationship of theory to practice and, above all, the relationship between words and images. But Leonardo's sources must often be glimpsed between the lines, whereas Francesco spelled out the same concerns and referred them directly to Aristotle. More than any of his artistic predecessors, Francesco collected Aristotle's fragmented discussions of method and attempted to synthesize them with the thoroughness of a systematic investigator. He also stripped the issues of the courtly witticisms that are typical of Leonardo's polemical writings.

In fact, the issue of method is central to a scientific artistic tradition that can be traced back from Francesco and Leonardo through Piero della Francesca, to Filarete, and to the investigations of many fifteenth-century artists; and also forward to writers like Benedetto Varchi and Daniele Barbaro, who will be introduced in Chapter Four. The immediate circle of Leonardo in Milan is rich with evidence of gathering interest in scientific method, but the development of better means for inquiring about contingent—that

¹⁶¹ Martini, *Trattati di architettura*, 2: 444–445; translation cited from Onians, *Bearers of Meaning*, 173. In this discussion, Francesco cites important discussions of method by Aristotle, “in the first book of the *Posterior Analytics* and in the second and third books of *On the Soul*.” Onians argues that Francesco was stimulated to develop the use of drawings through his study of Aristotle, who served as his model, not for form or content, but rather for his new interest in method, which is “something less definable but more essential” (Onians, 181).

is, human—knowledge was also shared with other fields. Through these shared interests (and texts), we can associate Leonardo's pursuit of interdisciplinary analogies with humanists like Giorgio Valla, Poliziano, and Landino; poets like Gaspare Visconti and Bernardino Bellincioni; and scientists like Niccolò Leonicensi and Marcantonio della Torre.

Justifiably revising grandiose claims made earlier in this century by Duhem and others for Leonardo's knowledge of Latin texts, recent scholars such as Carlo Dionisotti have been careful to refer Leonardo's ideas to sources available in the vernacular, popularizing literature accessible to an audience of his limited education.¹⁶² Yet even Augusto Marinoni, the most cautious of scholars on the sensitive subject of Leonardo's Latin, admits that if Leonardo read any Latin, he might have read Scholastic scientific writings.¹⁶³

Leonardo's booklists confirm this view, for he owned vernacular editions of Ovid, Plutarch, Diogenes Laertius and others, and Latin editions of Pecham, Walter Burleigh, and, among others, Giorgio Valla's *De expetendis et fugiendis rebus*, recognized by Marinoni as one of Leonardo's most important scientific sources.¹⁶⁴ Even if Leonardo did not read all the books he owned, and sought help to read passages in Latin, or misconstrued what he read, his writings show that he was well read in the sciences and not unfamiliar with current literary trends.

When an autodidactic thinker like Leonardo refers indirectly or inaccurately to texts he may not have read, or may have read idiosyncratically or learned about in conversation, it is especially difficult to determine the context for his ideas and always advisable to exercise caution.¹⁶⁵ Although the problems of interpretation are

¹⁶² Dionisotti, "Leonardo omo di lettere," 183 ff.

¹⁶³ Marinoni, *Gli appunti grammaticali e lessicali di Leonardo Vinci*, 1: 156, as opposed to the literary Latin of Cicero or Ovid. For an excellent discussion of Leonardo's scientific knowledge, see de Santillana, "Leonard et ceux qui'il n'a pas lus."

¹⁶⁴ Leonardo's booklists are compiled and analyzed in *The Madrid Codices*, 3: 92–107. See further Pedretti, *Commentary* 2: 355–68, on the *Madrid Codex II* booklist, citing Reti's initial publication, "The Two Unpublished Manuscripts of Leonardo da Vinci" (1968); and Maccagni, "L'Elenco di Libro di Codice 8936 della Biblioteca Nacional di Madrid," 298–299. Marinoni, *Gli appunti grammaticali e lessicali*, was first to emphasize the importance of Valla's humanist encyclopedia for Leonardo's mathematical studies, and for our knowledge of his terminology. Marinoni, 154, concludes that most of Leonardo's Latinisms could have come indirectly, from vernacular sources, and that they coincide with the usage of a great many contemporary writers. On Leonardo's knowledge of classical literature, see Griffiths, "Leonardo and the Latin Poets."

¹⁶⁵ To cite a praiseworthy example of scholarly restraint and precision, Marshall Clagett, in his analysis of Leonardo's knowledge of Archimedes, concludes that "in all likelihood" Leonardo had some indirect knowledge of

acute, the aim of the present study is not to identify Leonardo's sources *per se* or to place him in the history of science or letters, but to understand his ideas. Therefore, it is pertinent to examine his language critically even when, or especially when, it refers to the precedent history of ideas equivocally and admits of multiple interpretations. Indeed, some of Leonardo's most impressive syntheses of subject matter can be referred only to possible sources, because the associations that he seems to have made, irreverent of intellectual conventions, also lack the conventional evidence by which direct sources can be ascertained.¹⁶⁶

Archimedes through medieval and Renaissance sources of which, with one exception, he made little direct use (*Archimedes in the Middle Ages*, 3, part 3: 523).

¹⁶⁶ A foremost example is Leonardo's conflation of the rhetorical and scientific associations of *rilievo*. Jacques Le Goff, "Mentalities: a history of ambiguities," 176, remarks: "The history of mentalities must also be distinguished from the history of ideas, out of opposition to which it also grew. It was not the ideas of Thomas Aquinas or Saint Bonaventura which, from the thirteenth century on, governed people's minds, but mental *nebulae* in which such ideas only play a part as deformed echoes, devalued fragments and words taken out of context. But this identification of bastardised ideas within mentalities must be linked to the history of the systems of culture, belief and values, the intellectual equipment through which mentalities appear and evolve."

CHAPTER THREE

LEONARDO'S DEFENSE OF PAINTING

An Overview of Leonardo's Arguments

The 46 passages compiled in the *Parte Prima* originate in various manuscripts of which only two are identified today.¹ The heterogeneous nature of the *Parte Prima* is due in part to its being an anthology of excerpted paragraphs and in part to the many sources of its richly conceived arguments. None of Leonardo's defenses of painting seem to derive wholesale from another source, but most of his individual arguments do have precedents, in some cases so many diverse precedents that it would be difficult to favor one at the expense of others. The passages are assembled thematically and arranged in roughly five subdivisions that reflect a humanist interpretation of the liberal arts. It is unlikely that Leonardo would have arranged his treatise in the same way.² The organization is useful, however, because the range of his comparisons between painting and each of the other arts can be seen at a glance.

Leonardo's central defense of painting is that it is a science, based on perspective and defined as the branch of optics that represents things on a flat surface.³ Painting is the primary focus in all of his polemics: the other arts merely help him to define it by contrast. Thus, his discussion of sculpture revolves around his scientific investigations of relief feigned in painting. Similarly, musical harmony, which he compares to the geometric proportions of perspective, is largely based on an understanding of proportionality as something that can be expressed as a visual configuration, an idea that he probably drew from Alhazen's optical theory or perhaps more immediately from Nicole Oresme.⁴

The comparisons with poetry form a somewhat special case, because such comparisons are so prominent in Leonardo's sources (see Chapter Two above). Aside from isolated texts like Dio

¹ The two known texts are *Ms. A* and the lost *Libro A*, reconstructed by Pedretti (1964). As the commentary notes to the *Parte Prima* texts reveal, because of the nature of this anthology, each passage must be established independently of the others in the context of Leonardo's surviving original notes.

² See the introduction to the *Parte Prima* texts.

³ There is a long history of scholarly debate concerning Leonardo's views on perspective; for a recent review, see Veltman, *Studies on Leonardo da Vinci I*, Introduction, and CN 3–6 here.

⁴ See discussion at CN 31.

Chrysostom's *Twelfth Olympic Oration*, there is no established literature for critical comparisons of painting and sculpture or painting and music. In several drafts included in the *Parte Prima*, Leonardo refers explicitly and repeatedly to the classical tradition of comparative literary criticism, *ut pictura poesis*, paraphrasing the maxim of Simonides told by Plutarch that painting is a mute poem. But in these passages Leonardo defines painting in literary terms insofar as pictorial ornament is an attribute of descriptive poetry. Thus, in his comparisons of painting to poetry the usual roles are reversed. Here as with all the other arts, however, poetry merely provides differentiating characteristics for defining painting.⁵

The pervasive influence of literary theory is most apparent when Leonardo's critical terms are considered. His central argument concerns the nature of artifice. Leonardo claims that painting is superior because perspective is evident artifice, which ornaments painting with copious variety that delights all viewers. This artifice is due to the inventive powers or *ingegno* of the painter who represents natural appearances truthfully. The painter's inventions spring from his imagination, which, by means of *disegno*, depicts the emotions and mental states ("mental accidents") of figures.

Much of this argument was indebted to Alberti's treatise on painting, which in turn was based on ancient Roman rhetorical theory, but the *ut pictura poesis* analogy also had an immediate history in artistic practice that valued ornament in a manner directly opposed to Alberti's restrained, neo-classicizing critical stance. Leonardo's coupling of *rilievo* and *ingegno*, key terms in his critical vocabulary, was fundamentally indebted to the workshop tradition that Cennini, more than Alberti, records. Leonardo praises painting in conventional terms by comparing it to poetic ornament, the *discrezioni* of landscape in particular, but he simultaneously devalues poetic artifice by claiming that visual images are better than verbal ones. Leonardo borrows from medieval *contrast*i and uses related motifs in the tradition of neoplatonic love poetry, but his adaptations are permeated with a scientific rationalism foreign to the original metaphors.⁶

One of the intriguing aspects of Leonardo's polemics on the arts is the manner in which a few motifs suggest so many different issues. The complexity of his ideas can be appreciated best by

⁵ On the other hand, when he compares painting to poetry with reference to compositional procedures, he probably depends on the theory of music rather than directly on literary theory. See CN 25.

⁶ Echoes by his contemporaries like Lorenzo de' Medici, Ficino, and Poliziano are discussed in CNs 22 and 24.

studying each individual passage, as the commentary notes accompanying the texts here do, but the main arguments against poetry, music, and sculpture can each be reduced to a sentence or two:

1. Painting is superior to poetry because it represents the works of nature, whereas poetry represents the lesser works of man, namely words, which are arbitrary conventions. A number of related issues, such as the scientific status of painted images, criteria for liberal as opposed to mechanical arts, and the reasons for preferring a visual image, stem from this basic argument.

2. Painting is superior to music because, even though both compose a "harmonic proportionality," painting can be contemplated as a whole at once and enjoyed for a longer period of time. Leonardo also adapted this argument to poetry, which is likewise ephemeral because it is temporal; and to sculpture, which does not present a whole seen all at one time.

3. Painting is superior to sculpture because it involves more mental effort and less physical exertion. A number of related issues develop from this argument, too, such as the characterization of sculpture as a "natural body" totally lacking in artifice (and therefore inferior to painting, the artifice of which, perspective, requires great *ingegno*, or mental effort); and praise of difficult artifice that measures the nobility of art by the role of the artist. These passages also present additional arguments about the liberal and mechanical arts, distinguished from one another on the basis of the kind of labor required, physical or mental, with reference to concrete artistic procedures.

The Visual Force of Painted Images

Displays of skill and ingenuity that emulate both nature and man-made art are at the center of Leonardo's defense of painting. Now that Leonardo's fragmentary literary remains have been ordered and medieval optics has been shown to be an important basis for the artist's definition of painting, it is finally feasible to study developmental aspects of the extensive manuscript evidence. The rest of this chapter is concerned with the ways in which Leonardo expected to create the optical effects that he associated with pictorial artifice in his theoretical considerations of painting.⁷

⁷ In addition to the recent ordering of Leonardo's literary remains by Carlo Pedretti and Anna Maria Brizio, significant specialized studies have contributed to a clearer understanding of Leonardo's optics; see Lindberg, *Theories of Vision*, 154–168; M. Kemp, "Leonardo and the Visual Pyramid"; Ackerman, "Leonardo's Eye"; Strong, *Leonardo on the Eye*; and most recently Veltman, in

As we have already seen in Chapter Two, Leonardo defined painting on the model of a *scientia media*, a term that was applied to Aristotelian sciences that "mixed" theoretical and practical knowledge. Leonardo defended the primacy of painting over the other arts on this foundation that painting is a physical science grounded in both mathematical principles and experience, like optics. The most mature version of his definition of painting is preserved in the first chapter of the *Codex Urbinas*, which has direct precedents in three drafts preserved in *Madrid Codex II*, defining painting as a mathematical science that belongs to geometry, the investigation of continuous quantities.⁸ In the *Madrid Codex* drafts, however, Leonardo did not yet distinguish clearly between mathematical and physical entities, as he would in later statements in the *Codex Urbinas* and elsewhere concerning pictorial composition based on optical principles.⁹

As Leonardo gradually refined his definition of painting as a science capable of achieving mathematical certainty, he drew close connections between sight and imagination (in terms of painted and mental images) grounded in the geometric analysis of light associated with Alhazen's theory of direct vision and medieval,

collaboration with Keele, *Studies in Leonardo da Vinci I*, 30–142 on the long history of scholarly debate concerning Leonardo's views on perspective. M. Kemp, review of Veltman, *Studies in Leonardo da Vinci I* justifiably takes Veltman's methodology to task. Lindberg, *Theories of Vision*, 168, writes that Leonardo frequently expressed a "confused and garbled form of traditional theory" that showed no understanding of the central issue of traditional optics, namely the problem of the multiplication of rays influencing all parts of the eye, and he tended to treat radiation in "an unsatisfactory holistic manner." Like the majority of studies to date, the analysis of Leonardo's optics by Eastwood, "Alhazen, Leonardo, and Late-Medieval Speculation," refers Leonardo's innovations to the history of science. The art historical scholarship has also emphasized the progressive aspects of Leonardo's optics at the expense of the Euclidean foundation of his views. As James Elkins recently noted in "Did Leonardo Develop a Theory of Curvilinear Perspective?," the Euclidean basis of Leonardo's knowledge is a significant factor even in his late writings, for example in his considerations of image size dependent on the viewer's angle of vision. The importance of the Euclidean tradition to Renaissance artists in general deserves further study, but see now, M. Kemp, *The Science of Art*. Euclid's optics was available in Leonardo's day in the recension of Theon of Alexandria: on the manuscript tradition, see Lindberg, *A Catalogue of Medieval and Renaissance Optical Manuscripts*, especially "version 1" of *De visu*, discussed on pp. 50–52, the text to which Leonardo most likely had access. For direct references to Euclid's *Optica* in Leonardo's manuscripts, see Hart, *The Mechanical Investigations of Leonardo da Vinci*, 62–63; and Pedretti, *Commentary*, *passim*.

⁸ The definitions in *Madrid Codex II*, are found on fols. 62bis/r, 66r, and 67v. Another draft is preserved in the *Codex Urbinas*, *Parte Prima*, Chapter 33. Pedretti, *Commentary*, 1: 122–123, discusses Leonardo's definitions of painting, with a transcription and translation of *Madrid Codex II*, fol. 67r.

⁹ Among the earliest indications of a changed attitude is a passage on CA 68 v–a: see Appendix 2.

non-Aristotelian psychology of the internal senses.¹⁰ The geometry that explains how light rays strike surfaces, and the conception of the imagination as part of a complex of internal organs with the capacity first to receive external images (like a mirror), then to combine, analyze, and store them, are the foundation for Leonardo's continuing discussions of color and light in relation to the visual force of painted images. A clear schematic diagram of this geometry is preserved in the *Parte Prima*, Chapter 4, in a passage entitled "Principle of the Science of Painting."¹¹

Leonardo synthesized literary and scientific theory when he discussed the visual force of painted images in terms of color and light. In many passages, he defended painting both as a science and as the most noble art because its artifice presents images to the imagination in conformity with the conditions of vision.¹² That is, painting was based on a theory of light and vision that accounted for actual appearances. For example, on *Ms. G*, fol. 23 verso, and CA 277 v-a, ca. 1513–1514, perhaps his latest comparison of painting and sculpture, Leonardo discussed how the artist manipulates oppositions of light and dark by selecting contrasting values for the sake of pictorial harmony. Leonardo's considerations of the bounding surfaces of objects, which developed through his study of mathematics, are the key to his evolving definitions of pictorial relief. His discussions of *disegno* in late writings such as the opening chapters of the *Codex Urbinas* identified painting completely with the science of *chiaro e scuro*, concerned with visible things like the (material) surfaces of bodies covered by (immaterial) color.

Only a sketchy chronology can be established for Leonardo's paintings. Extensive manuscript evidence, however, confirms and provides a rich context for examining Leonardo's developing interest in reflected color, manifested as an increasingly complex tonal structure and progressively lighter palette, as John Shearman discovered by means of formal visual analysis.¹³ As a prime example of Leonardo's late style, Shearman discusses the Louvre *Virgin and Child with St. Anne*. But the ongoing conservation of the *Last Supper* demonstrates that Leonardo had lightened his palette at the

¹⁰ A study of Alhazen that, unfortunately, appeared too late to be used here is Sabra, *The Optics of Ibn-al-Haytham*.

¹¹ Compare Pecham, *Perspectiva communis*, I.29{32} (ed. Lindberg, 111, with a diagram): "The eye would be unsuited for perception of size if it were not round."

¹² A majority of these passages are collected in the *Parte Prima* of the *Codex Urbinas*. A guide to related passages in Leonardo's extant notes is given in Appendix 2.

¹³ J. Shearman, "Leonardo's Color and Chiaroscuro." For a historiographical overview, see Gage, "Color in Western Art."

least by the mid-1490s, about three years after he recorded extensive discussions of reflected color in *Ms. A*. As the following discussion will clarify, even if the *Last Supper* was not entirely typical due to the experimental nature of the medium Leonardo employed, its coloristic qualities are in line with trends clearly noticeable in the Louvre *Virgin and Child with St. Anne*. New evidence arising from the conservation of the *Last Supper* indicates that Leonardo tried to apply color in transparent layers, probably in imitation of oil techniques indebted to the example of Flemish art, which he emulated even in his earliest Florentine works.¹⁴

But Leonardo's considerations of tonal relief and color cannot be separated in the way that many scholars today assume. Modern distinctions between "hue" and "value" are misleading categories to provide criteria against which to judge Renaissance discussions.¹⁵ In *De sensu et sensato* (442a), a leading source of these discussions, Aristotle arranged colors on a linear scale as intermediaries between the extremes of light and dark, and compared the mixture of colors to sounds and to the layering of pigments by painters (*De sensu et sensato*, 442a and 439). This seven-color scale, however, is

¹⁴ On the restoration of the *Last Supper*, see Brambilla Barcilon, *Il Cenacolo di Leonardo*, especially p. 12; Brown, *Leonardo's Last Supper*. On Leonardo's color, see Matteini and Moles, "A Preliminary Investigation," and "Il Cenacolo." I am grateful to Jennifer Rashleigh, to whom I owe these references, for discussing the issues with me. See her Master's thesis, "The Science of Leonardo's Art," 57–62.

¹⁵ For example, Cropper, "Poussin and Leonardo," 570–582, who states (578) that Pietro Accolti's joint interests in relief and color "seem to reflect his criticism of the continuous quality of Leonardo's *sfumato*, where color is often sacrificed to shadow, or where relief melts away into an infinity of reflections"; and (581) that Poussin's ordering of light and darks in *Rebecca and Eliezer at the Well*, Paris, Louvre, painted in the 1640s, "is quite contrary to the *sfumato* of Leonardo's practice." A similar misconception underlies Dempsey's *Annibale Carracci*, in which he superbly analyzes (30–36) how sixteenth-century painters handled color, a subject of considerable complexity that deserves even further attention, yet Dempsey also claims that "Leonardo had all but banished color from his art through his infinitely minute divisions of the half-tones of reflected light" (31). The basis of all Renaissance discussions of color is Aristotle, who also defined the kinds of colors as originating from the ontologically essential white and black, which are contrary extremes between which every color comes to be or passes away (*Generatione et Corruptione* 328b). According to this principle of arranging colors on the ontological model of opposing contraries, paired colors had opposing values. White and black were one accepted pair, followed either by yellow (or red) and blue, and red and green (or gray). This organization could suggest other, similar patterns such as musical notes to name an analogy offered by Aristotle, or patterns of painted color, as Alberti suggested (*On Painting*, Book II.48). For a useful overview of Renaissance terminology, see Gavel, *Colour*. On the Aristotelian tradition of color inherited by Renaissance artists including Leonardo, and its later association with musical theory, see now M. Kemp, *The Science of Painting*, 264–284 ff., and my remarks in the Acknowledgments, n. 4; here, n. 36.

more complex than a scale based simply on light intensity, such as Plato's color ladder of gradations arranged according to luminosity (*Timaeus* 67E5–8), or the even older classification of Democritus, who identified white, black, red and green with the four elements. This system apparently dominated ancient literature.¹⁶ Working within the Aristotelian tradition he inherited, Leonardo tried to formulate a theoretical model for painted color consistent with direct visual experience—or at least consistent with certain critical assumptions that he defined in terms of direct experience, such as the beauty of apparent color fully illuminated by light. Leonardo belongs to a scientific artistic tradition that needs to be distinguished from the tradition of modeling with color, most recently glimpsed in the restoration of Michelangelo's Sistine ceiling frescoes, and already discussed in medieval painting manuals as early as the tenth century.¹⁷

If he had differentiated between qualitatively and quantitatively intense light as we do today, Leonardo probably would not have arrived at the conclusion that painting can represent on optical principles the beauty of color fully illuminated by light. Like many of his contemporaries, Leonardo expressed values in relative terms as geometric ratios, not absolute measurements.¹⁸ This habit of thinking in terms of ratios and proportional relationships ($a:b=c:d$) allowed him to develop principles of pictorial composition that do not differentiate between the quantity of bright light and its quality of brightness. As early as *Ms. A*, fol. 84 recto, ca. 1492, Leonardo cautioned painters not to be misled by heightened contrasts resulting from the direct juxtaposition of white and black.¹⁹ Yet the same

¹⁶ Democritus identified white, black, red and green with the four elements. This classification is rudimentary in its understanding of hue, as compared with Aristotle's classification. Democritus differentiated light intensities alone; Aristotle ordered hues sequentially on the model of nature's rainbows. Pliny, Galen, and the anonymous author of *De coloribus* demonstrate the tenacity of Democritus's views (see de Santillana, *The Origins of Scientific Thought*, 165).

¹⁷ See Bulatkin, "The Spanish Word 'Matiz.'" On related Renaissance uses of color as evident artifice, see Summers, "Contrapposto."

¹⁸ On the practical applications of the "Rule of Three" and other useful kinds of computation based on proportional relationships, like gauging, see Baxandall, *Painting and Experience in Renaissance Italy*, 86–108.

¹⁹ Leonardo, *Ms. A*, fol. 84r: "On painting." The varied comparisons of various qualities of shadows and lights oftentimes make the painter who wants to imitate and counterfeit things that he sees hesitant and confused. The reason is this: if you see a white drapery compared with a black one, the part of the white drapery that is juxtaposed to the black one will appear much brighter than the [same] part juxtaposed to the greatest whiteness, and the reason for this is proved in my perspective. (De pittura. Il vari paragoni delle varie qualità, d'ombre e lumi fanno spesso volte, ambiguo e chonfuso il pittore che vuole imitare e chontraffare le cose che vede. La ragione è questa: se ttu vedi un panno biancho, al pari ad uno nero,

habit of comparing qualitative and quantitative values (expressed as proportional relationships) also allowed Leonardo to claim that the viewer who cannot tolerate a certain quantity of intense, colored light when he looks directly into the path of that light can delight in its quality of *splendore*, or brilliance, when he sees it from an oblique angle.

Accordingly, Leonardo devised optical principles to guide painters that take into account hue, value, and point of view, even though he never separated these considerations into such modern categories. In his early writings, he followed the same headings derived from optical treatises as Alberti, to devise categories like *corpo*, *figura*, and *colore* (*Ms. A*, fol. 92 verso); or linear perspective, perspective of color, and the perspective of moving into the distance (or more literally, "expedition" [*spedizione*] but there is no adequate translation for the term) which describes how things appear less defined when they are further away (*Ms. A*, fol. 98 recto). These categories are the precedents to Leonardo's eventual distinction between formal optics and pictorial perspective, i.e. between "natural" and "accidental" or "artificial" perspective.

The "Trattato Sequences": Apparent and Pictorial Color

Leonardo's emerging thoughts on the qualitative aspects of color can be examined in a series of substantially intact notebooks accounting for the thirty years of his literary activity. According to this evidence, Leonardo did not articulate clear distinctions between formal optics and pictorial perspective until the end of his career: not until ca. 1508 did he define a discipline concerned exclusively with graphic representations on a flat surface. Leonardo recognized differences between natural vision and artificial perspective as early as *Ms. A*, ca. 1490–1492, but these categorical terms first appeared in his writings around 1508. The actual state of affairs has been clarified only very recently by Martin Kemp, who notes that Leonardo differentiated between "natural" and "artificial" (i.e., pictorial) perspective for the first time in writings datable to the late period of his literary activity.²⁰

cierto, quella parte d'esso panno bianco, che chon finerà chol nero, apparirà molto più chandida che quella che confinasse con maggiore bianchezza. E lla ragion di questo si prova nella mia Prospettiva.) Transcription based on *Ms. A*, ed. de Toni/Corbeau.

²⁰ M. Kemp, "Leonardo's Visual Pyramid," 147–148, citing *Codex Arundel* 62r (R. 109, c. 1508), one of the earliest recorded statements of this distinction, along with discussions in *Libro A*; see especially Cartas 16, 34, 64, and 68). We usually (mistakenly) assume that these categories were clearly differentiated by the time of Leonardo. Alberti, notably, never used the word *optica* or *perspettiva* in his treatise

For the most part, Leonardo's categories and terminology regarding the nature of perspective remained fluid throughout his career, but we can generalize upon the forty-plus definitions that survive in his notes. In their original context, his formal definitions of painting as perspective record how Leonardo progressively and definitively shifted painting away from the direct imitation of natural appearances and towards a theory of artificial pictorial composition. He consistently counseled painters to choose carefully among appearances in nature. In his early writings, however, Leonardo recommended that painters imitate as closely as possible the most subtle gradations of light and shadow,²¹ whereas in his last recorded statements he advised painters to create strong contrasts of color according to their own *ingegni*, but founded on a knowledge of optical principles.²²

We can examine the development of Leonardo's ideas by comparing the formal definitions of perspective embedded in discussions of painting preserved in four manuscripts for which we have a firm relative chronology: *Ms. A*, ca. 1490–1492; *Madrid Codex II*, 1503–1505; and *Mss. E* and *G*, ca. 1510–1515. In writings that span the course of Leonardo's literary career, these definitions recur in connection with loosely associated topics of discussion that are found in a repeated sequence. This recurring sequence of topics may be described as a "trattato sequence" inasmuch as the order and form of discussion follow Alberti's *Treatise on Painting* of 1435, which Leonardo studied at the time he wrote *Ms. A*. The pattern of ideas, moreover, does not occur in Leonardo's earlier discussions of perspective, such as the optical treatise *Ms. C*, ca. 1490, or the series of sheets from a dismembered notebook datable ca. 1489, which was incorporated into the *Codex Atlanticus*.²³

on painting (1435/1436), despite the long discussion he devoted to the subject we call pictorial perspective. Leonardo's reluctance to define pictorial perspective has caused a great deal of confusion among modern students of his writings, who have transferred his late terminology to discussions of his early writings. This confusion has been perpetuated by the most comprehensive ordering of Leonardo's manuscripts to date: see Pedretti, *Libro A*, 171, and *Commentary*, I: 119; Strong, *Leonardo on the Eye*, xxxii, expresses agreement with Kemp, but his study depends on Pedretti's widely accepted views (compare Strong, 208).

²¹ For example, on *Ms. A*, fol. 100v: "Dell'elezione dell'aria, / che dia grazia ai volti. / Se avrai una corte, da potere a tua volontà coprire con tenda di lino, questo lume sarà buono. Ovvero, quando vuoi ritrarre uno, lo ritrai a cattivo tempo, sul fare della sera, . . . ai volti d'uomini e donne quando è cattivo / tempo; quanta grazia e dolcezza si vede in loro! . . . E questa è / perfetta aria." Transcription based on *Ms. A*, ed. de Toni/Corbeau.

²² For example, in *Ms. G*, fol. 23 verso.

²³ The *Codex Atlanticus* sheets are related to *Anatomical Ms. B*, fol. 42r, dated April 2, 1489, according to Brizio, "Correlazioni e risposdenze"; the texts are collected in Brizio, "Fogli d'anatomia e di ottica," in *Scritti scelti*, 153–172. See

The "trattato sequence" occurs eighteen times in Leonardo's intact manuscripts. If partial sequences are taken into account, the sequence occurs over forty times (a comprehensive guide to manuscript sources is given in Appendix 1). With some variations, the sequence consists of a formal definition of the parts of perspective, followed by a discussion of problems of *rilievo* associated with painting. Comparisons of the arts, or of the senses, occur in the midst of these discussions. The sequence ends with precepts addressed to painters on the order of Alberti's prescriptions for figurative decorum in Book 2 of the *della Pittura* (II.34–45).²⁴ In the course of time, Leonardo progressively conflated the definition of painting as perspective and Albertian prescriptions for figurative decorum, so that pictorial decorum was described in increasingly formal terms. Late statements by Leonardo owe little to Alberti's moralizing theory of pictorial order, although these discussions preserve traces of the "trattato sequence" in both form and content. The earliest sequences are closest to Alberti, and *Ms. A* includes closely paraphrased passages. On the other hand, Leonardo's discussions of perspective and *rilievo* composed even earlier than *Ms. A* reveal a level of knowledge beyond anything Alberti wrote—as one might expect from Leonardo's assimilation of medieval optics by 1489–1492.²⁵

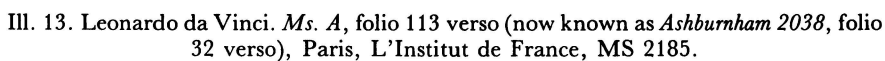
Leonardo's idiosyncratic interest in optics, which seems so peculiar from the standpoint of the history of science, is substantially clarified by the discussions of painting in the "trattato sequences." We can gain an overview of ongoing issues he investigated in these sequences by singling out his treatment of color in relation to lustre. Leonardo approached the problem as a painter who needs to create the illusion of lustre. He examined color in painting from the viewpoint of a *scientia media* that reconciles experience with optical principles.

Leonardo considered the topic of lustre as part of the larger problem of reflected color, a subject that accounts for many if not most of his studies of the action of light. Lustre, a point of light

further Pedretti, *Commentary*, to R. 60 (CA 138v–b). On Leonardo's study of Alberti, see Clark, "Leon Battista Alberti on Painting"; Zoubov, "Leon Battista Alberti et Leonardo da Vinci"; Pedretti, *Libro A*, 59–61, 117, and *passim*.

²⁴ Alberti, *On Painting*, 2: 35–45. Furthermore, Leonardo's scientific discussions of painting correspond to the first book of Alberti's treatise, while his comparisons of the arts correspond to Alberti's praise of painting at the beginning of Book 2. Many of Leonardo's arguments in defense of painting repeat points made by Alberti. On the history of the term, see Freedman, "'Rilievo' as an Artistic Term in Renaissance Art Theory."

²⁵ Problems of interpretation concerning Leonardo's understanding of optics around 1490 are discussed most fully by M. Kemp, "Leonardo's Visual Pyramid," and Ackerman, "Leonardo's Eye."



which moves as the eye moves, is a special case of the general principle that the reflected image of an object can be seen from all points of a plane mirrored surface placed parallel to that object. Today we restrict the definition of lustre to that gleam or sparkle that changes and scintillates as the viewer moves—distinct highlights, that tend to settle on ridges or protrusions of lit objects.²⁶ For many years, Leonardo investigated the phenomenon of lustre—in ways departing radically from modern understanding of the phenomenon—in broader terms as the most beautiful condition of apparent color.

The subject of lustre occurs only incidentally, along with many other observations, in the early *Ms. A* but is reformulated with increasing insistence and clarity in later sequences. In early passages, Leonardo associated the uncolored light of lustre reflected off the surface of an object with the study of color reflected onto that object by other, colored objects in its vicinity. On folio 100 recto of *Ms. A*, he applied the problem of reflected color to painted *rilievo*, in a passage entitled “Come i corpi bianchi si devono figurare,” (how white bodies ought to be represented) which occurs in the original manuscript between two other passages included in the *Parte Prima*.²⁷ On folio 113 verso of *Ms. A* (Figure 13), Leonardo defined lustre as uncolored light, distinguishing it on this basis from other kinds of light, and compared it to the beauty of colored, reflected light: “Which part of color, reasonably speaking, ought to be the most beautiful? . . . [with a geometric diagram]. . . . The illuminated part which we call rose . . . will be much more beautiful. . . . The difference between lights and lustres is that lustres are not numbered among the colors, and they are always white, and born from the crests [highlights] of bodies which are bathed [in light], and its light takes its color from the place where it is born, like gold or silver, or similar things.”²⁸

²⁶ As the following discussion elaborates, Leonardo defined lustre in terms never intimated by Gombrich in his two classic essays reconstructing historical notions of lustre from both visual and textual evidence, “The Heritage of Apelles,” and “Light, Form and Texture in Fifteenth Century Painting,” both reprinted in *The Heritage of Apelles*. Leonardo would not have disagreed with Gombrich’s characterization, but his conception led him to incorporate other phenomena as well in his definition.

²⁷ This paragraph continues a discussion on the adjacent page, folio 99, a polemical comparison of painting and poetry included in the *Parte Prima* as Chapter 19, by adding to that discussion that surfaces such as faces are “animated” by shadow and light, which are the components of *aria*. It also precedes another passage included in the *Parte Prima*, as Chapter 12, so its relationship to Leonardo’s polemical comparisons of the arts could not be clearer. See also, CN 19.

²⁸ In *Ms. A*, fols. 112–113, Leonardo discussed light, including lustre. The full text of the passage on folio 113 recto is: “Dico che il lustro, perche è tutto per tutto

About ten to fifteen years after he wrote *Ms. A*, when he recorded his thoughts on lustre in *Madrid Codex II*, Leonardo made the same connection between lustre and reflected color on even stronger terms. On folio 26 recto, he described lustre according to three categories of colored light: the color of the light source, the color of the body that reflects the light source, and the color of the body through which this light passes if the body is transparent:

Lustre will take on much more the color of the light that illuminates the reflecting body than the color of that body. And this occurs in the case of opaque [*dense*] surfaces. The lustre of many umbrageous bodies is entirely the color of the illuminated body as in the case of burnished gold and silver and other metals, and similar things. The lustre of leaves, glass, and jewels will participate little in the color of the body where it is born, and a lot in the color of the body that illuminates it. Lustre generated in the depth of transparent solids has the first degree of beauty of that color, as is seen in the case of rubies, glass and similar things. This happens when all the natural color of the transparent body comes between the eye and that lustre.²⁹

Leonardo's language makes sense if we understand the phenomenon of lustre on the principle that rays causing lustre travel through a medium (such as air or water), just like other forms of reflected light that strike the surface of a mirror or some other kind of body. Reflected color was a subject traditionally discussed in optical treatises which, even before Leonardo, had entered into scientific discussions of painting.³⁰ Aristotle, as is well known, defined color

e tutto nella parte, che, stando nel punto .d., il lustro sembrerà nel punto .c., e tanto quanto l'occhio si tra muterà dal .d. all' .a., tanto il lustro si tramuterà da .c. ad .n. [fol. 113v:] Quale parte del colore, ragionevolmente, deve essere/ più bella? [Figure]. Se .a. sarà il lume, .b. sarà illuminato per linea da esso lume .c., che non puo vedere esso lume, vede solo la parte illuminata, la quale parte diciamo che sia rossa. Essendo così il lume ch'essa la faccia .c. . E se .c. sarà ancor esso rosso, vedrai essere molto più bello che .b. . E se .c. fosse giallo, vedrai li crearsi un colore cangiante fra giallo e rosso. Che differenza è da lumi a lustri è come i lustri non sono nel numero dei colori, ed è sempre bianco, e nasce nei colmi dei bagnati corpi, ed il lume è/ del colore della cose dove nasce, come oro od argento o simili cose. Transcription based on *Ms. A*, ed. de Toni/Corbeau.

²⁹ *Madrid Codex II*, fol. 26 recto: "Il lusstro participa assai più del color del lume che allumina il corpo che lusstra che del colore d'esso corpo, e questo nasscie in superfitie dense. Il lustro di molti corpi onbrosi e integralmente del colore del corpo alluminato, come quello dell'oro brunito e argento e latrì metalli e simili corpi. I' lusstro di foglie, vetri e gioie poco parteciperà del colore del corpo ove nasscie e assai del color del corpo che llo allumina. I' lustro fatto nella profondita de' densi trasparenti, sono in primo grado della bellezza di tale color, come si vede dentro al rubino balasscio, vetri e ssimil cose. Quessto acade che' infra ll' ochio e esso lusstro s'interpone tutta il colore natural del corpo trasparente." Emphasis added. Transcription based on *Madrid Codex II*, ed. Reti, 5: 39.

³⁰ For the closest parallel in optical treatises to Leonardo's formulation of the problem of reflected color, see Pecham, *Perspectiva communis*, 88–89, Proposition 1.14 {29} (based on Alhazen, *Opticae thesaurus*, Bk. 1, sec. 17; and cited by Witelo,

as visible, sensed light that moves the imagination (*De anima* 428b). Color resides in the limit of the transparent; it "always inheres in the bounding surface. . . . Thus the conditions which in air produce light and darkness in bodies produce white and black" (*De sensu et sensato* 439b). Aristotle also discussed apparent color in terms of its movement through the medium of air, in the *Meteorologica*, and he ordered the hues sequentially on the model of nature's rainbow (*Meteorologica* 374b). It seems that Alberti was indebted to this discussion since he evolved the same ideas in the same order in the first book of *De pictura*.³¹ Alberti reserved a discussion of lustre for his second book, to describe a difficult challenge for pictorial representation: skillful painters can juxtapose light and dark pigment to imitate the appearance of shiny metal surfaces.³² Writing about two decades after Alberti, Lorenzo Ghiberti also included a passage on reflected color entitled "corpo bianco et mondo," in his third *Commentari*, copied directly from an Italian translation of Alhazen's *De aspectibus*, perhaps even the same manuscript that Leonardo later consulted.³³ Leonardo's investigation of reflected color follows the same scientific tradition.

Opticae, [bound as part of Alhazen, *Opticae Thesaurus*], Bk. 4.156. The problem of reflected color was also discussed by Robert Grosseteste and Roger Bacon; see Lindberg, *Theories of Vision*, 245, n. 43. This and other correspondences between Witelo and Leonardo were first discussed by Tea, "Witelo prospettico del secolo XIII." The problem of reflected color can be traced to Aristotle, *De sensu et sensato* 439a30 ff.; and the anonymous author of *De coloribus*, IV.793b24. The medieval transformations point to a widely diffused tradition. Leonardo's discussions related to *Ms. A*, fol. 100r (cited in n. 27), have been assembled by Maltese, "Leonardo e la teoria dei colori."

³¹ Another important early record attesting to the acquaintance of artists with Aristotle's discussion of color in the *Meteorologica* is Giovanni da Fontana's (lost) treatise on perspective, which treated gradations of color and light (not linear mathematical perspective), known through a publication of 1544. Fontana was a leading personality in Venetian scientific culture around the middle of the fifteenth century; his treatise cited Biagio Pelacani as his "master," and the work was dedicated to Jacopo Bellini. See Canova, "Riflessioni su Jacopo Bellini." Perhaps the earliest indication that Aristotle's scientific discussion of color was useful to artists is Francesco della Lana's description of drapery folds in terms of advancing and receding color, in his commentary on Dante's *Paradiso*, Book 24.25-27 (first noted by von Schlosser, *La letteratura artistica*, 91; see most recently Summers, *The Judgment of Sense*, 16, n. 8).

³² In his discussion of the science of painting, Alberti, *On Painting* 1.11, observed that: "Reflected rays assume the colour they find on the surface from which they are reflected. We see this happen when the faces of people walking about in the meadows appear to have a greenish tinge." Alberti discussed lustre in a separate passage concerning pictorial composition (Book 2.47): "This composition with white and black has such power that, when skillfully carried out, it can express in painting brilliant surfaces of gold and silver and glass."

³³ Both texts are cited by Federici-Vescovini, "Il problema delle fonti ottiche medievali del Commentario terzo di Lorenzo Ghiberti," 370 (see also p. 369, on the contraction of the pupil in bright light). There is another fifteenth-century

"Bello Rilievo" and the Problem of Pupil Dilation

In the scientific tradition of Alhazen, Leonardo examined the optical laws governing *rilievo* and investigated the representability of appearances on a flat surface. By considering the difficult cases for the representation of relief, Leonardo also confronted those natural conditions in which the causes of appearances are unknown or of relative uncertainty. This brought the burden of proof to bear on the *ingegno* of that painter who could discover means of demonstrating nature's laws in painting.

Leonardo judged painted color according to the manner in which its *bellezza*, *chiarezza*, *splendore*, and *varietà* correspond with direct optical experience.³⁴ Since Leonardo thought about painted color in terms of apparent color, and since he defined apparent color in terms of colored light (that, according to the Aristotelian tradition, inheres in the boundaries of objects), it is not surprising that he described color using the vocabulary of light—color has beauty, clarity, and brilliance (*bellezza*, *chiarezza*, *splendore*), thus producing the conditions that the painter imitates to achieve *varietà*. The most beautiful color, and the greatest variety of colors, he argued, were produced by the natural conditions that governed lustre, a special case of reflected color, on the principles of geometry.

By demanding a close correspondence between painted images and direct experience, however, Leonardo raised a conflict not raised in the optical literature. The mingling of reflected colors in mirrors had been discussed among the errors or "fallacies" of vision as early as the second century by Ptolemy, one of Alhazen's main sources, who included it as a difficult problem of perception that potentially refutes (but actually verifies) optical theory; Ptolemy also discussed the case of illusionistic painting in his section on fallacies, describing the difference between constructions

treatise on perspective in the vernacular that is indebted to Alhazen: variously attributed to Alberti, Leonardo, and the mathematician Paolo Toscanelli, it is reprinted by Parronchi, who attributes it to Toscanelli (*Studi su la dolce Prospettiva*, 599–641).

³⁴ Leonardo's use of *splendore* and *chiarezza* corresponds closely to his sources in optical treatises, while his valuation of *varietà* is also indebted to Alberti; see further discussion at CNs 20 and 21. On the critical value of optical metaphors pervasive in rhetorical theory and literary criticism, such as *chiarezza*, *lustre*, *splendore*, *obscurità*, which were returned to their original context of the visual arts by Renaissance writers, see Summers, "*Contrapposto*"; and Baxandall, *Giotto and the Orators*. A study that deals with Leonardo's optics in relation to his pictorial conventions but does not account for the mitigating role played by critical metaphors is Gombrich, "The *Trattato della Pittura*: Some Questions and Considerata."

on a flat surface and actual sculpted relief.³⁵ One interesting variant of this discussion that praises the deceptive appearance of imitated relief over actual relief, occurs in fourteenth-century commentaries on Aristotle's *De anima*.³⁶

Leonardo, however, investigated the relationship between color fully illuminated by light and the limited ability of the pupil of the eye to endure such brightness. Among his artistic predecessors, Alberti notably avoided all consideration of ocular anatomy, and did not deal with the internal senses. The problem of pupil dilation was discussed by optical theorists, however, and Leonardo's considerations of pupil dilation have been singled out as central to his investigations in optical science, and an area in which he made original contributions.³⁷ In *Madrid Codex II*, Leonardo discussed at length in relation to painting the problem of how the imagination is to receive the most beautiful color.³⁸ On folio 26 verso, for example, he stated that: "When the object is strongly luminous, the pupil, not being able to tolerate it, contracts until the likeness of the luminous object reaches the pupil with diminished brightness and magnitude. Because of this diminution the sense is capable of tolerating the brightness facing it."³⁹

³⁵ Ptolemy included imitated relief among the errors of vision, where he also discussed the manner in which apparent color mingles with color reflected from other things in mirrors (*L'Optique de Claude Ptolémé*, Book 2.108, 67 ff. on the mixture of colors reverberating in a mirror; Book 2. 124, 74 ff. on illusionistic painting); Book 4, devoted to the mingling of colors in reflected light. On the contribution of the fallacies of vision to Renaissance art, see Summers, *The Judgment of Sense*, 36.

³⁶ Marshall, "Two Scholastic Discussions of the Perception of Depth." The problem of reflected color can be traced to Aristotle, *De sensu et sensato*, 439a30 ff., and the anonymous author of *De coloribus*, a text attributed to Aristotle and widely read during the Renaissance period (Aristotle, *Minor Works*, iv.793b24). Medieval transformations of the problem point to a widely diffused tradition which became conflated with certain Platonic ideas. As early as *De coloribus*, a distinctly Platonic list of simple colors is combined with observations of nature dependent on Aristotle. Compare Bartolomaeus Anglicus (*On the Properties of Things*, p. 1268). For studies of Renaissance color, see Ackerman, "On Early Renaissance Color Theory and Practice"; Edgerton, "Alberti's Color Theory"; Hall, ed., *Color and Technique*.

³⁷ Lindberg, *Theories of Vision*, 162, 168; see also Strong, *Leonardo on the Eye*, 343-345.

³⁸ On fols. 25 verso and 26 verso, the pages immediately preceding and following his discussion of lustre in the *Madrid Codex*, Leonardo considered how the internal organ of the *imprensiva* will respond to intense light. On Leonardo's term *imprensiva*, a physical organ of perception which receives the images of objects, is apparently an original coinage that corresponds roughly to Avicenna's *imaginatio*; see further discussion in CN 2. All the passages on painting in *Madrid Codex II* concern the relationship between the imagination and perceived color; see Appendix 1 for a summary of the subjects.

³⁹ *Madrid Codex II*, fol. 26 verso: "Quando il predetto obbietto sarà forte

Leonardo's considerations of pupil tolerance are closely related to discussions at the beginning of optical treatises in the tradition of Alhazen, who, following Aristotle's theory of the limits of sense discrimination, associated intensely bright light with pain.⁴⁰ Although he rejected the argument by ca. 1490 (in favor of intromission), Leonardo was also familiar with Pecham's discussion of the extramission of light by the eye, which followed Aristotle even further by contending that the natural light emitted by the eye plays a role in vision by moderating excessively bright lights so that they do not overwhelm the power of sight.⁴¹

Leonardo formulated the same problem concerning pupil tolerance that he had raised in the *Madrid Codex* more clearly about five years later in *Ms. E*, which was composed after further investigations of pupil dilation and image formation (found in *Mss. D* and *F*, both datable ca. 1508).⁴² Related statements on pictorial *rilievo*, also subsequent to these investigations, probably occur first in *Libro A*, ca. 1508–1510, where the exact sequence of the passages, however, cannot be reconstructed.⁴³ Leonardo defined the problem in a series of propositions in *Ms. E*, fol. 17 verso, dated by Pedretti 1513 or slightly later. The conflict that concerned him is that darkness is the best condition for the eye to see and know, but brightness is the best condition for essential, or fully illuminated, color:

luminoso, la popilla, non la potendo soportare, si fa ttanto minore, che la similitudine di tale luminoso obbietto viene alla popilla non manco diminuità de ssple[n]dore che di magnitudine. Per qual diminutione il senso po suportare l'antiposto splendore." Transcription based on *Madrid Codex II*, ed. Reti, 5: 41. A closely related discussion occurs on fol. 27r: see the Appendix. As Martin Kemp notes in "Leonardo's Visual Pyramid," 137, one of the earliest coherent discussions of pupil contraction in bright light, in relation to the brain, is recorded in the *Codex Forster II*; 2.2, fol. 158 verso, c. 1495 (*Il Codice Forster*, 280–281). Kemp also cites a group of related passages in the *Codex Atlanticus*, of uncertain date (on the dating of these passages, compare Pedretti *Commentary* to R. 111), but he did not discuss Leonardo's treatment of this problem in *Madrid Codex II*.

⁴⁰ Sense discrimination was described in terms of pain and pleasure by Aristotle throughout *De anima*. The tradition developed through Galen whose *De usu partium*, Book 10 (on the eye), became another textual source for the association of sight with pain. Leonardo's knowledge of Galen is discussed in Chapter Two. On the history of the textual tradition, see Lindberg, "Alhazen's Theory of Vision and Its Reception in the West," especially 322–323.

⁴¹ Lindberg, Introduction to Pecham, *Perspectiva communis*, 34–35, on proposition 1.46 {49}. Leonardo was aware of Pecham's argument, which he rejected ca. 1490 (see further discussion by Ackerman, "Leonardo's Eye," 127 ff.). But as late as ca. 1510 Leonardo referred to Pecham's examples of the nocturnal vision of animals, for example in *Ms. E*, fol. 17v.

⁴² My dating of these manuscripts follows the persuasive argument by Strong, *Leonardo on the Eye*, 212 ff.

⁴³ Pedretti, *Libro A*, 25. These passages are included in Appendix 1.

Painting. First. The pupil of the eye diminishes as much as the quantity of illumination increases and impresses itself.

Second. The pupil of the eye increases as much as the brightness of the day or other light that impresses itself on the pupil diminishes.

Third. The eye sees and knows the things that are its object so much more intensely as its pupil dilates and this is proved in nocturnal animals like cats and other, flying [animals] like the owl whose pupil makes the greatest variation between large and small in darkness and illumination.

Fourth. The eye placed in illuminated air sees darkness behind the illuminated windows of dwellings.

Fifth. All the colors placed in shadowed places appear to be of equal obscurity among themselves.

Sixth. But all the colors placed in luminous places never vary from their essence.⁴⁴

As this sequence clearly shows, the problem Leonardo saw (taking sides with those scientists who defined categories of dark, unsaturated and bright, saturated colors) is that colors are most essentially themselves in bright light, which the pupil cannot tolerate.⁴⁵ He restated the last two propositions about color in terms of the "*natural bellezza*," in a passage on the next page, folio 18 recto, under the heading "*pittura*":

Colors placed in shadow participate more or less in their natural beauty as they will be more or less dark; the greatest beauty is in the luminous, great *splendore*.⁴⁶

⁴⁴ Ms. E, fol. 17v: "Prima / Pictura. La popilla dell'ochio diminuisscie tanto la sua quantità quanto ecesscic illuminoso che in lei s'inpreme. / Seconda / Tanto cresscic la popilla dell'ochio quanto diminuisscie la chiarezza del giorno od altra lucie che in lui s'inpreme. / Terza / Tanto più intensivamente vede e chonossic l'ochio le chose ch'elli stanno per obbietto quanto la sua popilla più si dilata e questo proviamo mediante li animali nocturni chome nelle ghatte e altri volatili chome il ghufu e ssimili li quali. La popilla fa grandissima variatione da grande appichola ec nelle tenebre o nella luminato. / Quarta / L'ochio possto nell'aria illuminato vede tenebre dentro alle finesste delle abitationi alluminate. / Quinta / Tutti li cholori posti in llochi onbrosi paiano essere de quale osschurit  infra lloro. / Sesta / Ma ttutti li cholori possti in lochi luminosinosi varian mai della loro essentia." Transcription based on Ms. E, ed. Ravaisson-Mollien. On lustre, see also Ms. E, fol. 31 verso, cited in Appendix 1.

⁴⁵ On these categories of apparent color, See Gavel, *Colour. A Study of its Position*, 27, who notes that *lucidus* means distinct or saturated, just as *obscurus* means indistinct or unsaturated colors in Ptolemy's *Optica*, although saturation was elsewhere connected with dark colors. See further discussion of Leonardo's study of saturated color in M. Kemp, *The Science of Art*, 267—269, connecting Leonardo's definitions with his knowledge of *De coloribus* around 1506 and his reading of Roger Bacon's *Opus majus*, which reinforced his fascination with colored lights and related phenomena.

⁴⁶ Ms. E, fol. 18r: "Pittura / Li cholori possti nelle onbre participeranno tanto pi  o meno della lor natural bellezza quanto essi saranno i minore o in maggiore osschurit . / Ma se lli cholori saran situati in ispatio luminoso allora essi dimossteran di tanta maggiore bellezza quanto iluminoso sia di maggiore splendore"

Leonardo imagined a scenario in which an adversary argued that the variety of colors visible in shadow is equal to the variety visible in bright light. Leonardo disagreed, maintaining that there is less variety in the darker surfaces (*vestite*) of painting.

The solution that Leonardo worked out to this problem of representing the *splendore* and *varietà* of color on optical principles (first in *Madrid Codex II* and elaborated in the lost *Libro A* and *Mss. E* and *G* with respect to pictorial composition) has already been mentioned: the viewer who cannot tolerate the intense light of *splendore* when he looks directly into the path of that light can delight in its beauty when he sees it from an oblique angle. Thus, by selecting these conditions for his depiction (which substitute perception of the quality of intense light for its quantity), the painter can present the viewer with the beauty of fully illuminated color on optical principles. Here, then, Leonardo defined painted color in terms of natural light effects. And, consequently, he defined painted color in terms of tonal unity: without light, all colors are perceived as being dark. In this way, Leonardo transformed the quantitative aspects of color into qualitative aspects that had critical values attached to them. And in doing so, he transformed words like *splendore*, *chiarezza*, and *oscurità* from the descriptive vocabulary of optics to the critical language of art.⁴⁷

Principles of the Science of Painting: Treatment of Boundaries

That Leonardo intended to provide the art of painting with a set of unified, scientific principles is suggested by the two distinct kinds of writings in which he treated problems of pictorial composition: advice addressed to students in the form of precepts, and discussions of optics, often in the form of propositions like the passage just cited from *Ms. E*, concerning the appearance of *rilievo* in painting. The original editor of the *Codex Urbinas* destroyed the organic relationship of these discussions when he separated passages connected in the original manuscripts to arrange them according to subject matter. Their context must, therefore, be studied in the original manuscripts. In their original order, that we have dubbed the “trattato sequences,” Leonardo recorded problems formulated with reference to optical principles tested against various kinds of experience such as descriptions of direct observations and imagined

(“chiarezza” preceding “splendore” and cancelled). Transcription based on *Ms. E*, ed. Ravaissou-Mollien.

⁴⁷ Optical *splendore* refers to highlights and lustre, but as a metaphysical principle, *splendore* signifies radiance, a reflection of supra-natural light; see Barasch, *Light and Color in the Italian Renaissance*, 171–179.

situations, "thought experiments," geometric sketches and calculations, and practical demonstrations. In other passages, he reduced his conclusions to the rules of a preceptive "art" suitable, like Alberti's treatise, for training students. These are the passages, most familiar to modern readers from the *Trattato*, commonly associated with Leonardo's pictorial procedures. Yet the precepts are intimately connected with, and truly inseparable from, the specific scientific discussions they once accompanied.

We can fully understand how the subject of lustre figured into Leonardo's considerations of painting only by turning to a second pictorial problem that he investigated through his study of formal optics. Discussing principles of pictorial composition in *Madrid Codex II* around 1503–1505, Leonardo was concerned with the problem of representing the most beautiful (i.e., fully illuminated) color, given the limited tolerance of the pupil to let light into the internal sense of the *imprensiva*. In the later *Mss. E* and *G*, the focus of discussion gradually shifted from the relationship between light and the internal senses of the explanation of the causes of observed phenomena. Comparison of the late writings with *Madrid Codex II* and *Ms. A*, and related evidence in other notes, suggests that in the course of his investigations of optics, Leonardo synthesized two distinct problems of pictorial representation that he drew from his Albertian inheritance and qualified on the basis of his scientific studies. One problem is what drawn lines can correspond to in nature, given that mathematical lines are not visible. The other is how to represent the greatest beauty of color on optical principles, given that the pupil cannot tolerate *splendore*. Beginning with his studies of Euclidean geometry around 1497, and during his subsequent investigations of light and shadow ca. 1502–1505 (and until his latest writings), Leonardo developed the basis for a new definition of painting that made the distinction between mathematical and physical line (a commonplace of Euclidean geometry) an important consideration.⁴⁸

The core of a consistent program for the representation of optical relief, the basis of Leonardo's last definitions of painting, appears in *Mss. E* and *G*. Here the artist was primarily concerned with light reflected at the boundaries (*termini*) of colored, curved surfaces, to the variable extents that these boundaries are distinct. In *Ms. G*, on fol. 23 verso, Leonardo gave a clear definition of artificial, or pictorial, perspective in these terms, corroborated by many other notes of the same period. Seen from the standpoint of his pictorial

⁴⁸ See discussion in CNs 1, 3–6, 9; and see passages cited in Appendix 2.

considerations in *Ms. G*, Leonardo's investigations of lustre in *Ms. A* and *Madrid Codex II* make much more sense:

The primary principal part of painting are the fields (*champi*) of painted things in which the boundaries (*termini*) of natural bodies have convex curvature. One always knows the figures of such bodies in the fields even though the colors of the bodies are the same color as the fields. This comes about because the convex boundaries of the bodies are not illuminated in the same mode by the same light that illuminates the field. Because of this, the boundaries are often more bright or more obscure than the field.

But if such a boundary is the same color as the field, without doubt, information about the figure with such a boundary will be prohibited in that part of the painting. And the choice of painting such as this is loathed by the *ingiegni* of good painters who know that it is the intention of the painter to make his bodies project from these fields. And in the said case the contrary thing happens—not only in the painting, but also in the things in relief.⁴⁹

In his late writings on painting, notably in *Libro A* and articulated even more fully in this passage from *Ms. G*, Leonardo seems to have reconciled the nature of line to the problem of representing the beauty of color: light is reflected at the edges of objects (i.e., boundaries seen in oblique view) differently from the way it is reflected from surfaces that face the viewer. His considerations, like Alberti's, belong to the Aristotelian-Euclidean science of optics that defines boundary as a surface which becomes an edge when it is seen in profile view. Lines are contours, and contours define the continuous gradation of surface, that is sculptural relief. But Leonardo's theory of pictorial composition is based on optical principles that, even more than Alberti's, evolved from the physical science of optics. Discussion of the difference between natural and mathematical lines in earlier mathematical theory was also readily available to Leonardo in a number of forms, including the practical

⁴⁹ *Ms. G*, fol. 23v: "De pictura / Principalissima parte della pittura son li chanpi delle chose dipincte nella qu li chanpi li termini delli chorpi naturali cheanno in lor churvita chonvessa senpre si chognosschano le figure di tali chorpi in essi chanpi anchora chelli cholor de chorpi sieno del medesimo cholor del preducto chanpo ec questo nasscie chelli termini convessi de chorpi non sono alluminati nel medesimo modo che dal medesimo lume è alluminato il chanpo, perché tal termine molte volte sarà più chiaro oppiù osschuro che esso chanpo./ Ma sse ttal termine è del cholore di tal chanpo senza dubbio tal parte di pittura proibiera la notitia della figura di tal termine, ecquesta tale eletione di pittura he da essere sciftata dalli ingiegni de buoni pictori chonciossia che lla intentione del pictore è ddi fare parere li sua chorpi di qua de canpi, e innel sopra decto chaso achade in chontrario, non che in pictura ma nelle chose di rilievo." Transcription based on *Ms. G*, ed. Ravaisson-Mollien. See Appendix 1 for other related notes of this period.

handbooks of geometry that he owned at the time he wrote *Madrid Codex II*.⁵⁰ Leonardo "corrected" Alberti, who recognized the difference but nonetheless equated mathematical lines with drawn lines (or marks on a surface), and said that the lines that can be represented in painted relief are the edges of objects visible in conditions related to lustre on the principles of geometry.⁵¹ In other words, continuous points of lustre are joined to make visible, physical "lines." We might think of the way the edge of an object sometimes glistens or gleams when the light strikes it in a certain way.

Beyond the simple incidence of lustre, Leonardo's main principle of pictorial composition in its most fully developed form, still within the Albertian tradition, was based on the optical principles governing the complex phenomenon of heightened contrast which results from the direct juxtaposition of different intensities of reflected colored light. Painters who do not develop their compositions carefully will produce images lacking in *grazia* according to a statement in *Libro A*, ca. 1508–10:

Objects against a bright and illuminated field display much more relief than against a dark one.

The reason for this proposition is that if you wish to show relief in a figure, you must depict it so that the part of the body farthest from the light participates least in that light, and thus will be darker, and since it terminates against a dark field, its boundaries become confused. For this reason, *if no reflected lights fall on it, the work remains without grace* and from a distance nothing will show except the luminous parts. It is correct, therefore, that the other parts be of a darkness similar to the same field from which the things appear detached and be kept less [dark] than they should be.⁵²

⁵⁰ On Leonardo's collection of geometry books known as *abbachi*, see *The Madrid Codices*, ed. Reti, 3:97, n. 34. Leonardo's commitment to the mathematical nature of line has even been singled out as a fundamental difference between his theoretical views of pictorial art and those of Alberti: Marinoni, "L'Essere del Nulla."

⁵¹ Compare Alberti, *On Painting* 1.2: "The first thing to know is that a point is a sign (*signum*) which one might say is not divisible into parts. I call a sign anything which exists on a surface so that it is visible to the eye." Alberti, Book 1: 48, also defined line "according to the philosophers" using the terminology of optical theory (derived from Galen, *De usu partium* 10.12; see Edgerton, "Alberti's Color Theory," 125). Compare Leonardo, *Parte Prima*, Chapter 37.

⁵² *Libro A Carta* 26.38: "Molto più rilievo dimostreranno le cose nel campo chiaro e alluminato che nell'oscuro. / La ragione di quel che si propone è che se tu vuoi dare rilievo alla tua figura tu le fai che quella parte del corpo ch'è più remota dal lume, manco partecipa d'esso lume, onde viene a rimanere più oscura; e terminando poi in campo oscuro viene a cadere in confusi termini, per la qual cosa, *se non vi accade riflesso, l'opera resta senza grazia* e da lontano non apparisce se non le parti luminose, onde conviene che l'oscure paino essere del campo medesimo onde le cose paiono tagliate, e rimanere tanto men che 'l suo dovere quant'è l'oscuro." (Emphasis added.) Transcription from Pedretti, 1964, 49 (see his n. 45

Overwhelming evidence suggests that Leonardo's desire to endow painted images with the greatest beauty of apparent color largely shaped the way he addressed pictorial issues. We are used to thinking about Leonardo's "tonal composition," but our modern vocabulary mitigates the central role played by *colore*, defined in Aristotelian terms different from our own, throughout the scientific artistic tradition.

On Leonardo's Contribution to Pictorial Perspective

The problem of depicting line and color on unified optical principles was central to the artistic tradition Leonardo inherited and tried to improve by providing painters with principles to manipulate pictorial structure. Leonardo's statements about composing paintings on optical principles seem closely related to the pictorial inventions we associate with new styles of optical naturalism, from Raphael's Roman period to painters associated with the reform of Italian painting in the later part of the sixteenth century, like Federico Barocci and the Carracci.⁵³ Even today we tend to think of painting that imitates optical effects as being devoid of artifice, although every image constructed of colors on a surface is, of course, completely artificial.

Leonardo's formulations have significant consequences for later scientific, artistic practices, but he was by no means the only writer to describe painting as a mathematical science. Like Lorenzo Ghiberti, Filarete, and Piero della Francesca, he followed Alberti's precedent.⁵⁴ Beyond this, issues that concerned Leonardo interested many other artists and writers. The scientific investigations of

for discussion of the translation), translating the last problematic phrase as follows: "It is correct, therefore, that the other parts be of a darkness similar to the background from which the figure has to appear detached, but keep them less dark than they should be on that background." The principle of heightened contrast through direct juxtaposition recurs frequently in *Libro A* on Cartas 25.35, 27.42, 30.53, 30.54, 35.77, and 43.93. On the relationship of these statements to the "trattato sequences," see Appendix 1. An early statement on the subject of heightened contrast occurs in *Ms. A*, fol. 84 recto, ca. 1492.

⁵³ On Leonardo's contribution to Raphael's style, see Weil-Garris Posner, *Leonardo and Central Italian Art*. For an introduction to recent issues concerning the late sixteenth-century reform of painting, see Dempsey, *Annibale Carracci*. Barocci may have known Leonardo's *Codex Urbinas* from the Castle Durante near Urbino where he was trained: See Gary Walters, "Federico Barocci," 43–44 ff. I thank Angela Lafferty for this reference.

⁵⁴ For recent surveys of Leonardo's precedents, see Elkins, "Piero della Francesca and the Renaissance Proof of Linear Perspective"; and Klaus Bergoldt, ed., *Der dritte Kommentar Lorenzo Ghibertis: Naturwissenschaften und Medizin in der Kunsttheorie der Frührenaissance* (Weinheim, c. 1988), which became available only after the present study was completed.

fifteenth-century artists were foreshadowed in Cennino Cennini's remarks that painting is *scienza* that deals with *rilievo*.⁵⁵ Less studied but equally significant, as we have seen in Chapter Two, are new versions of an Aristotelian classification of knowledge proposed by leading Quattrocento humanists who aligned painting, sculpture, and architecture with the new productive, applied sciences, as well as the liberal arts. By the mid-sixteenth century, arguments for the liberal (or near-liberal) status of the visual arts were conceived in a fully Aristotelian framework that, like Leonardo's, drew on Galen's discussions of methodology.⁵⁶

Historians of science like David Lindberg have recently suggested that Leonardo was an autodidactic thinker who had a poor conception of the issues facing formal optics. In relation to the history of art, however, his scientific investigations had significant historical consequences. For Leonardo, the primary importance of the geometry that explains the physical action of light is the analogy between mental images, painted images, and images reflected in mirrors. Leonardo championed the nobility of sight in Scholastic terms, and furthermore he investigated vision on the mechanical model of percussive motion. The implications of his theory of vision for the status of art as knowledge are enormous. In his comparison between painted images of God and "any other science of human work," in *Parte Prima* Chapter 7, for example, Leonardo followed the tradition of Hugh of St. Victor and Bonaventure to argue eloquently for the power of the artist's *ingegno*. Leonardo's argument also recalls medieval justifications for images based on their ability to communicate the intelligible. St. Augustine had described the didactic function of "illumination" as throwing "light upon meaning" for those who desire instruction (*De doctrina christiana*, 4.30). He distinguished between good, functional artifice (which instructs) and bad artifice, which is merely decorative, resting on false doctrines. Writers following Augustine described figures of speech as "images" indispensable to poetic language because, like painting, verbal images communicate by signs and function as language for the illiterate, as in the case of the *Biblia pauperum*. Thus (borrowing an ancient rhetorical paradox), illusionistic painting is more true the more false it is. Leonardo's

⁵⁵ Cennini, *Il libro dell'arte*, Chapter 1. Most recently on the scientific investigations of fifteenth-century artists, which are relatively well studied, see M. Kemp, *The Science of Art*, Chapter 1.

⁵⁶ For the personalities, see Mendelsohn, *Paragoni*. Benedetto Varchi and Vincenzo Borghini set traditional issues of the debate between painters and sculptors firmly into the Aristotelian context of the productive sciences. See Chapter Four.

conception of painted images, that artifice is praiseworthy if it is substantive, if it not only delights but also moves and instructs the beholder, is in effect an answer to Plato's condemnation of sophistry in the form that it was elaborated by the Christian tradition of St. Augustine.

The praise that critics accorded painted *rilievo* constructed on a model of perception that Leonardo inherited from his predecessors (and bequeathed to his successors) is well documented by seventeenth-century writers such as Mosini, Agucchi, Félibien, Bellori, and even by less theoretical writers like Gerolamo Tezio, the author of the guide to Urban VIII's "Museum" in the Palazzo Barberini, mentioned in Chapter Two. Leonardo's writings on light and shadow, color, and atmosphere took on a new importance in the seventeenth century. Mathematical treatises on perspective did not furnish academically trained painters with the information they needed to compose *bello rilievo*. Writings devoted to shadow projection, which also dealt with the tonality of surfaces (i.e., *rilievo*), come closest and artists utilized these texts.⁵⁷ But Leonardo's writings on optics in the tradition of natural science, and other treatises in the same vein (which included Zaccolini's commentary on Leonardo's optics, treatises by Accolti, Cardano, Cigoli, Lomazzo, and others who are less well studied, that have been mentioned in Chapter One), met artists' needs for the graphic treatment of *rilievo*, and especially for a systematic explanation of color based on optical principles.

Growing interest in Leonardo's writings since the mid-sixteenth century points to a complex situation, but from the information presently available it is already obvious that of all his writings, his statements on optics in relation to painting most interested, and indeed preoccupied, artists and patrons by the opening decades of the seventeenth century. Sixteenth- and early seventeenth-century artists had access to Leonardo's optical writings from the original

⁵⁷ For the history of writings on shadow projection, see most recently Bauer, "Experimental Shadow Casting"; see also Kaufmann, "The Perspective of Shadows"; M. Kemp, "Geometrical Perspective from Brunelleschi to Désargues," who assembles massive evidence to argue, p. 89, that "the development of perspective science away from the concerns of artists had become pronounced by 1600." Field, "Giovanni Battista Benedetti" characterizes Benedetti as a "natural philosopher employing the methods of geometry" (p. 95). This turn of events nonetheless suggests, in fact corroborates the likelihood, that Leonardo's writings on *chiaro e scuro* and other treatises in the same tradition filled a much-needed gap in the education of artists during the same period. Brown University, *Children of Mercury*, includes an overview of teaching practices in early art academies, with a thorough bibliography.

notebooks and especially from abridged manuscripts of the *Trattato*.⁵⁸ While these artists would not have had the overview of Leonardo's writings that we have today, their own familiarity with the same basic sources in Euclid, Galen, and the optical literature would have enabled them to grasp the pictorial issues he addressed. Indeed, from the critical literature as well as the visual evidence, it might be suggested that the artist's inventive powers, his license to invent, were redefined in terms of the optical science concerned with the representation of surfaces, a science that was exclusively the province of painters in the late sixteenth and early seventeenth centuries, when the modern separation of art and science did not yet exist.⁵⁹

Counter-Reformation writers and their seventeenth-century successors who wrote about artistic invention were aware that the faculties of the artist's imagination remain free to combine and analyze images, as poets and painters traditionally had license to do, but they added the new stipulation that their inventive powers be subordinated to the decorum of the subject matter defined in conformity with the conditions of vision. Thus, optical effects were appropriate for the representation of supra-natural events such as the celestial visions favored by post-Tridentine painters of devotional subjects. Images like these supposedly called attention away from the artist's skill by presenting an image so real that it could be taken for the event itself. The critical dimensions of these developments have a long history. This history is the subject of the next chapter.

⁵⁸ While the *Parte Prima* of Leonardo's *Trattato* evidently did not circulate, four of the passages could have been known from *Ms. A*, and perhaps others from *Madrid Codex II*, *Libro A* (now lost), and other notes, such as several sheets compiled into the *Codex Atlanticus* and the lost *Codex Sforza* mentioned by Gian Paolo Lomazzo: see Steinitz, *Leonardo da Vinci's Trattato della Pittura*, 21–26; Pedretti, *Libro A*, 121–128, and *Commentary* 1: 76–86. On the history of the *Codex Urbino*, see Steinitz, 39–44, and Pedretti, *Commentary* 1: 12–14. An overview of the evidence, with references, is found in Chapter One. Most of these activities centered around Cassiano dal Pozzo in Rome; see Haskell, *Patrons and Painters*, 97–114. On Cassiano's use of Leonardo's manuscripts, see most recently Bell, "Cassiano dal Pozzo's Copy of the Zaccolini Manuscripts." On Poussin's study of Leonardo's writings, see Elizabeth Cropper, "Poussin and Leonardo."

⁵⁹ Bell, "Cassiano dal Pozzo's Copy of the Zaccolini Manuscripts," draws the same conclusion from her evidence. The forthcoming study of Federico Borromeo by Pamela Jones will clarify the relationship of Counter-Reformation art theory to earlier writings and later artistic practices.

CHAPTER FOUR

LEONARDO'S CONTRIBUTION TO THE *PARAGONE* TRADITION

Leonardo's statements on perspective were at the center of controversy over French academic theory shortly after his *Trattato* was published in 1651.¹ But the reception of his theories in the middle of the seventeenth century was conditioned by current debates over the nature of the visual science of art, specifically concerning the value of linear mathematical perspective as opposed to observations of light and shadow atmosphere, and color judged by the eye. Fifty years earlier in Bologna and Rome, the Carracci and Correggio developed new styles of optical naturalism under the pressure of the Counter Reformation.² How were they, and artists working in regional centers in North Italy, remote from modern ideas in Venice, Florence, and Rome, able to cultivate styles of devotional painting leading to the Carracci Academy? Do these events not imply that painters and viewers shared widely-held assumptions concerning the power of images? In the early seventeenth century, the activities of Pope Urban VIII and other patrons with ecclesiastical connections imply that the theory of images associated with the decrees of the Council of Trent, and subsequent attempts to redirect artistic invention and restrict artistic license, are somehow linked with a definition of painting based on a model of scientific truth. Federico Borromeo's *Musaeum* in Milan, another project in the same vein as the collection of the Barberini Pope, was planned as a supplement to an art academy for teaching students how to reform religious art according to post-Tridentine criteria set forth in Borromeo's 1624 *De pictura sacra*.³ A patron of both science and

¹ According to M. Kemp, "'A Chaos of Intelligence,'" Leonardo's concerns with figurative decorum were "readily absorbed into the developing academic ideals" (417), but his statements on perspective were found to be lacking in coherence and organization by Abraham Bosse and others who, opposed to the policies of Charles LeBrun, advocated the constructional techniques of geometric perspective.

² For this assessment of Correggio's impact on Italian painting, see Washington National Gallery of Art, *The Age of Correggio and the Carracci*, especially Briganti, "Lombard Character, Roman Ideas, Etruscan Spirits, and the Antique in Emilian Painting of the Sixteenth and Seventeenth Centuries," xv-xxx.

³ Pamela Jones, "Federico Borromeo as a Patron of landscapes and Still Lifes: Christian Optimism in Italy ca. 1600., and "Federico Borromeo's Ambrosian Collection as a Teaching Facility for the Academy of Design."

art, Borromeo, like Cardinal Francesco Barberini's secretary Casiano dal Pozzo in Rome, encouraged artistic instruction indebted directly to Leonardo's scientific teachings.

For Borromeo, as for other ecclesiastical writers of his time, science and metaphysics were inextricably linked. Borromeo, for example, considered painting naturalistic if it stimulated the physical appearance of nature in an optical sense, and also embodied nature's metaphysical significance in order to stimulate the contemplative mind.⁴ Post-Tridentine theorists reinterpreted Leonardo's theories in ways he could never have anticipated, and his writings form only one thread in the fabric of their theories of sacred painting. But the status of painting before the mid-seventeenth century design-color disputes were in full swing demands a complete reexamination. This chapter will suggest that early modern associations between optical naturalism and metaphysics are rooted in medieval discussions of painting, sculpture, and the other productive arts. Leonardo's contributions and those of his mid-sixteenth century successors signaled significant changes in a tradition continuously transformed by successive generations of writers.⁵ The political and religious circumstances that contributed to later events deserve a separate study; but perhaps the present investigation can contribute to our understanding of the reception of Leonardo's writing. His arguments allow us to see longer continuities that might not be apparent between medieval and seventeenth-century debates.

The Status of the Sixteenth-Century Artist

A wide variety of fifteenth-century sources indicate that the patron was commonly identified to be the "maker" or "artist" of the works he supported.⁶ This definition of the artist, so different from our

⁴ Jones, "Federico Borromeo as a Patron," 270, places Borromeo's religious beliefs into the context of Christian optimism; she points to his sources in the Jesuit reformer Roberto Bellarmine's method of spiritual ascension through meditation on the mundane world (*De ascensione mentis in Deum per scalas creaturarum*, 1615).

⁵ Chapter Two. The Council of Trent revived a theory of images associated with the Iconoclastic controversies of the eighth century, on which see, Ladner, *The Idea of Reform*; Herrin, *The Formation of Christendom*. For the decrees concerning sacred images, adopted in the final, twenty-fifth session, see Schroeder, *Canons and Degrees*, 215–217, 482–485.

⁶ On the identification of the patron as artist, see Gombrich, "Early Medici as Patrons"; Ettlinger, "The Emergence of the Italian Architect"; Goldthwaite, *The Building of Renaissance Florence*; Long, "The contribution of architectural writers"; and Liebenwein, "The Prince as Artisan and Artist," in *World Art 2*: 465–469. On the changing social status of the artist, see Burke, *The Italian Renaissance Culture*; Rossi, *Dalle botteghe alle accademie*, 74–122.

own that it is alien to our entire understanding of artistic identity, merits attention specifically in connection with the status Leonardo accorded painters. Complicated issues surround historical changes in the status of artists; among other things, one must distinguish carefully between the notions of artists themselves and the status ascribed to them by others. Nonetheless, it seems clear that during the century after Leonardo's death a rise in the self-image of the artisan was associated with the widely accepted idea of painting and sculpture as mathematically based, intellectual disciplines that require skill, or *techne*, to provide viewers with morally edifying images, just as Alberti had stated in his treatise on painting. This image was officially sanctioned (and given concrete form) by academies of art beginning with the foundation of the Florentine Accademia del Disegno in 1563 under the protection of Cosimo I.⁷

As early as the mid-fifteenth century, patronage practices encouraged (and no doubt also reflected) a growing preference for artifice that depends on scientific knowledge, conspicuously displayed in artistic feats of illusionism involving knowledge of perspective and anatomy.⁸ Leonardo does not specifically address the role of the patron, but his claim for painting as a liberal art in this respect resembles discussions of decorum involving the patron. Aristotle's discussion of the virtue of magnificence in the *Nicomachean Ethics* is an often-cited text that clarifies the connections drawn in fifteenth-century discussions between scientific art and proper patronage practices. Aristotle compared the magnificent patron with the artist specifically for their shared ability to admire artistic excellence, and on this basis the ancient philosopher distinguished between liberality and magnificence. "At an equal expense," Aristotle asserted, "the [magnificent man] will produce a more magnificent work of art. For a possession and a work of art have not the same excellence. The most valuable possession is that which is worth most, e.g., gold, but the most valuable work of art is that which is great and beautiful, for contemplation of such a work inspires admiration and so does magnificence" (*Nicomachean Ethics* 1122b13–18).⁹

⁷ The statutes of the Accademia were rediscovered and published by Pevsner, *Academies of Art*, 296–304. For the complete text, see Reynolds, "The 'Accademia del Disegno' in Florence." See also Goldstein, *Visual Fact over Verbal Fiction*; Ważbiński, *L'Accademia Medicea del Disegno*.

⁸ Gombrich, "The Early Medici as Patrons of Art"; Jenkins, "Cosimo de' Medici's Patronage of Architecture."

⁹ Magnificence was discussed as a virtue by medieval writers, according to Onians, *Bearers of Meaning*, 123–124; Baron, "Franciscan Poverty and Civic Wealth." Aquinas substituted "wise man" for Aristotle's "artist" (*Commentary on*

If the virtue of magnificence, as Aristotle explained, depends on the ability to spend money tastefully, then it is the duty of the patron to distinguish good art from bad—the choice being not between *gloria* and vainglory as early Quattrocento theologians preached, but between vulgar excess and admirable discretion practiced on a grand scale. Alberti's *De re aedificatoria*, completed around 1452, recommended a generous use of wealth in certain cases, when the patron was of sufficiently elevated rank (such as the Roman *curia*, for which Alberti worked at the time), to achieve a classical style graced with prolific ornamentation *all'antica*.¹¹ But the evidence also implies that later fifteenth-century patrons were still sensitive to the charge of ostentatious display. As Timoteo Maffei, abbot of the Badia in Fiesole, sought to convince Cosimo's de' Medici's detractors around 1451, magnificent architectural projects and attendant furnishings avoid the sin of ostentation by obeying the laws of social propriety.

the Nicomachean Ethics, ed. Rowan, 4. Lect. 6: C 707–718, 1: 309). Compare Alberti, *On Painting* 2.49, which may allude to Aristotle's distinction between vulgar ostentation and right expenditure.

¹⁰ The rhetorical categories of Alberti's idealistic program for architectural decorum, arranged according to social rank, are based on Cicero's embellished middle style and his ornate or epideictic style, the latter meant for display and delight and suited for the most elevated, well-educated patrons. On the history of Alberti's patrons, see Westfall, *In This Most Perfect Paradise*. This program was repeated and elaborated by Filarete; see Onians, "Filarete and the 'quality.'" Alberti's generally restrained views on architectural decorum were also expressed in the choir he planned for SS. Annunziata. The circumstances of this incident are well known (see Heydenreich, "Die Tribuna der SS. Annunziata in Florenz"; and Wittkower, *Architectural Principles in the Age of Humanism*, 6, with references to more recent scholarship). Aldobrandi criticized the round temple form Alberti had proposed on grounds of its liturgical unsuitability, and he also objected to Alberti's treatment of ornament, limited to the rational integration of proportions. Alberti claimed that "purity and simplicity of color—as in life—is most pleasing to God," and that pictures are therefore preferable to frescoes, statuary to pictures (*De re aedificatoria*, Book 7, chapter 10; as cited by Wittkower, *Architectural Principles*, 9). Wittkower branded Aldobrandini as a reactionary critic in comparison to the neoclassicist Alberti, but Aldobrandini's views can also be interpreted as a reflection of the new demand for rich ornament, which first emerged around 1450. Apparently, these and other abstract arguments traveled from considerations of literary style and architecture to painting and sculpture (and reappeared in many "paragoni" of the arts) but of course these commonplaces were open to a variety of critical interpretations.

¹¹ Timoteo Maffei, *In magnificentiae Cosmi Medicei Florentini detractores*, as translated by Jenkins, "Cosimo's Patronage," 166, citing the manuscripts in Florence, Biblioteca Laurenziana. Timoteo may have known this text more directly from Thomas Aquinas, according to Jenkins (165), who cites *Summa Theologica*, IIae, q. 134, a. 1–4, with a descriptive analysis of parallel passages. Timoteo might also have known Aquinas' commentary on the *Nicomachean Ethics* (IV.L.6: C 707–718, cited in n. 10). Timoteo's *apologia*, while it portrays Cosimo in Aristotelian terms as a citizen of exceptional worth, also has a peculiarly Quattrocento

Timoteo defended Cosimo's practice of placing his *impresa* on his buildings, in Aristotelian terms. According to Aristotle, a magnificent man will furnish his house to suit his wealth because a house is a kind of public ornament, and he will spend what is becoming on every class of things (*Nicomachean Ethics* 1123a7–10). According to Timoteo:

Cosimo's magnificence in building monasteries and temples placed divine excellence before one's eyes. . . . And in his house, he has not thought about what Cosimo wanted but what was consistent with such a great city as Florence, in that he thought that if he was not going to look ungrateful it was necessary that he should appear more fully equipped and more distinguished than the other people in town in the same proportion as he received benefits from it greater than theirs.¹³

In Florence relaxed restrictions on conspicuous spending around the middle years of the Quattrocento resulted in the construction of elaborate private palaces, and also a series of tombs, family chapels, and other church decor that marked a shift from colossal displays of communal patronage (as exemplified by the sculpture commissioned on a scale not seen since Antiquity for Or San Michele).¹² By the closing decades of the fifteenth century, a corollary to this trend can be discerned, in expensive private chapels that were elaborately painted with fictive architecture also rich in ornamentation *all'antica*. Albertian (and Aristotelian) ideals were exemplified in these monuments, many of which were completed in the 1490s, that display their wealth in artistic skill rather than expensive materials: Filippino Lippi's Carafa Chapel in Santa Maria sopra Minerva, Pinturricchio's Bufalini Chapel in Santa Maria in Arcoeli, both in Rome, and two Florentine family chapels, Filippino's decorations for the Strozzi Chapel in Santa Maria

shading, as other literary sources make clear. Throughout the fifteenth century, building donations were conceived as penitence and atonement for political violence and usury by theologians like Giovanni Dominici and his student Saint Antonine. Timoteo no doubt addressed detractors like these when he made a pointed contrast between Cosimo's debt to God and the desires of "religious people and clerics." For another description of a palace that discusses the furnishings in terms of magnificence (with Aristotle's emphasis on decorum), see the anonymous *Speculum principis*, composed in 1497 in the vernacular, published by Gundersheimer, *Art and Life at the Court of Ercole I d'Este*.

¹² A trend first described by Gombrich, "The Early Medici as Patrons," citing the tabernacle in SS. Annunziata, 48; and later by Jenkins, "Cosimo's Patronage." When St. Antonine, Archbishop of Florence and founder of the Convent of San Marco, died on May 2, 1459, his passing away no doubt relaxed attitudes towards the display of material wealth. See also Clough, "Federigo da Montefeltro's Patronage of the Arts," 139. Recent revisionist studies of Renaissance patronage practices have stressed the familial, corporate network; See Gundersheimer, "Patronage in the Renaissance."

Novella, and Domenico Ghirlandaio's paintings for the Sassetti Chapel in Santa Trinità, are among the earliest and most prominent examples (Figure 14).¹³

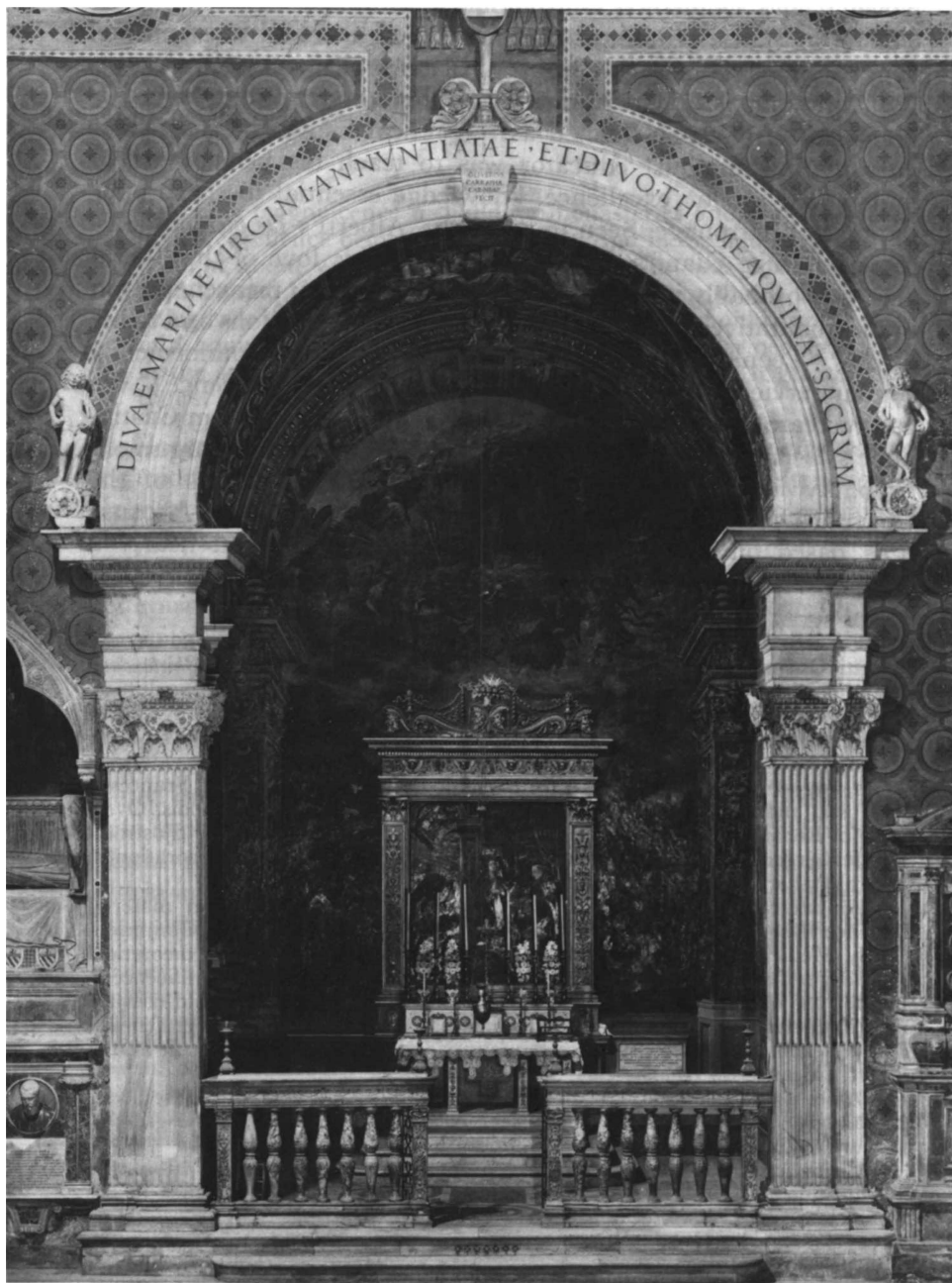
Alberti and Timoteo Maffei wrote for a society that placed a premium on painting defined as theoretical knowledge.¹⁴ A chief duty of the humanist educator was to teach his benefactors to understand artistic excellence, knowledge essential to the proper practice of patronage. Seen in this light, Alberti's *De pictura*, dedicated to Duke Gianfrancesco Gonzaga for his love of the liberal arts, was probably in part intended to educate that princely patron in the qualitative difference between material possessions and noble works.¹⁵ Leonardo's defense of painting may have performed a similar service as a lesson in the meaning of "magnificence." We can recreate its initial reception most vividly perhaps from Castiglione's *Il libro del Cortegiano*, where, in an entertaining argument probably invented by Leonardo, fictionalized members of the Court of Urbino decide that painting is the most noble art because it is based on the science of perspective.¹⁶ Published nearly a century after Alberti wrote his treatise, Castiglione's nostalgic

¹³ On the Carafa Chapel, see Geiger, *Filippino Lippi's Carafa Chapel*. On the Sassetti Chapel, see Borsook and Offerhaus, *Francesco Sassetti and Ghirlandaio*. Splendid displays of pictorial ornament including feigned marble sculpture, bronze, and other materials appear also in altar paintings, especially North Italian productions, near the turn of the sixteenth century, such as Ercole dé Roberti's *Enthroned Madonna and Child with Saints*, c. 1480, now in the Brera Gallery, Milan, and works by the aged Mantegna, Carlo Crivelli, Cosimo Tura, Francesco del Cossa, and numerous examples of the Paduan and Ferrarese Schools. Overviews of Renaissance illusionistic decorative systems are available by Sjöström; Württenberger; Bergström; Schulz; Sandström; Blunt, "Illusionist Decoration in Central Italian Painting," as cited in the Consolidated Bibliography.

¹⁴ An increasing trend toward art grounded in skill rather than material opulence has been discussed by Baxandall, *Painting and Experience*. (Gombrich, "Early Medici as Patrons of Art," 39.) Timoteo defined art as the theoretical knowledge of reasons, while Cosimo's detractors contended that magnificence is merely "the making of large things" and therefore that posterity would count a magnificent man among the manual laborers, that is among the menial craftsmen. Timoteo echoed a distinction between quantity and quality of artifice made also in Alberti's treatise *On Painting* 2.34–35.

¹⁵ Alberti, *On Painting*, Dedication: "I wished to present you with these books on painting, illustrious prince, because I observed that you take the greatest pleasure in these liberal arts [*ingenuis artibus*]. . . ."

¹⁶ Castiglione, *Il libro del Cortegiano*, Book 1, chapters 49–53. Part of the conversation recapitulates Aristotle's discussion of virtue and prudence in the *Nicomachean Ethics*, Book 6. The courtier's guiding principle is the Aristotelian concept of "mediocrity," defined as the virtuous mean between extremes—an appropriate choice to elaborate a discussion based substantially on Cicero's description of the ideal orator, the *uomo universalis*, and Quintilian's *vir bonus dicendi peritus* (compare Quintilian, *Inst. orat.* 12. 1.3–36). For the source of Castiglione's ideal courtier in Cicero's *De oratore*, see Rebhorn, ed., *Courtly Performance; La Corte del Cortegiano*.



Ill. 14. Filippino Lippi. Carafa chapel, entrance. 1489–1492. Fresco. Rome, Sta. Maria Sopra Minerva.

account of a vanished way of life similarly associates the cultivation of painting and sculpture with the liberal education of the aristocracy in ways that bring life to Leonardo's more fragmentary literary remains.

Such information as we have about the Florentine Accademia del Disegno confirms that the tenor of arguments about art changed considerably when discussions moved out of the courtly environment that supported Leonardo and his peers. Vasari, describing the precedents for the Accademia, in 1568, conceived that the "modern age" of artists had begun with the school in the sculpture garden of San Marco, where Michelangelo as well as Leonardo were supposed to have studied the antique under the patronage of Lorenzo de' Medici.¹⁷ Yet the evidence for the existence of such a school is slight. Even more apochryphal is another precedent mentioned by Vasari, "Leonardo's academy," known only from six engravings that carry the inscription "ACADEMIA LEONARDI VINCI." There is not a shred of concrete evidence that Leonardo's academy ever existed beyond a witty conceit to praise the reputation of a patron who enhanced his own magnificence by retaining a constellation of court luminaries.¹⁸

Even less evidence exists that "Leonardo's academy" was a teaching institution. The first visual record of a formal school for artists (other than workshop instruction for apprentices) is Veneziano's 1531 engraving of Bandinelli's "Academy," but again, the evidence may be a fictionalized account.¹⁹ Even though actual functions of the Florentine Accademia del Disegno are still incompletely understood, (it seems that the teaching academy *per se*, with a definite philosophy of training, was established only in the late

¹⁷ Vasari, *Le Vite*, 4: 7–15. Vasari describes the garden academy in the lives of Torrigiano, Condivi, and Michelangelo; see references to the scholarship in note 19.

¹⁸ Perhaps, as scholars formerly assumed, this academy was connected with a debate among artists, scientists, and engineers held—according to Luca Pacioli's testimony—in 1498 in the presence of Duke Lodovico. The debate is reported by Pacioli, *De divina proportione*, 3–4. Müntz, *Leonard de Vinci*, accepted the existence of Leonardo's academy and Pevsner, *Academies of Art*, 25 ff., begins his history with a discussion of the scholarly debates concerning its possible structure. The issue has been considered moot by recent scholars; see the summary in Goldstein, *Visual Fact over Verbal Fiction*, 29.

¹⁹ On Bandinelli's "Academy," See Weil-Garris Brandt, "The Self Created Bandinelli," in *World Art* 2: 497–501. There is no record of any formal school of instruction. See, [Providence] Brown University, *Children of Mercury*, which sums up the literature on both Bandinelli engravings (the later one of 1550 engraved by Enea Vico). Goldstein, *Visual Fact over Verbal Fiction*, 8, has related this to Vasari's reports that several artists' clubs held regular meetings in the early sixteenth century.

sixteenth century with the Carracci Academy in Bologna), as early as 1564 Vincenzo Borghini, second in command at the Accademia del Disegno in Florence, complained that his fellow members needed to search for differences between the arts in works rather than in words about them, for when "you enter into disputes, you leave your own house, where you are in charge, and enter the house of philosophers and rhetors where you do not have much of a part."²⁰

The struggle of artists to achieve social status paralleling that of the *litterati* has been discussed by scholars in connection with Cosimo I's support of artists. Traditional views of Cosimo I's effect on the arts at a time when he was facing serious political threats have been negative, equating his censorship and control of the literary Accademia Fiorentina with the fate of the Accademia del Disegno.²¹ Rudolf and Margot Wittkower have put his actions in a more positive light, however, suggesting that Cosimo was not adversely disposed towards the aspirations of the art academy and, in fact, lent reasonably enthusiastic support to the plans for Michelangelo's funeral in 1564.²² Vincenzo Borghini and Giorgio Vasari used the occasion of the funeral to their advantage by establishing a powerful position for their newly formed academy under the autocratic rule of Cosimo, flattering the liberality of their monarch by producing decorative programs illustrating civic allegories, like the schemes for the Ducal Palace as well as for the funeral itself, which are in effect panegyrics in visual form. The symbiotic relationship between Cosimo and Vasari is illustrated by Vasari's frescoes in the Palazzo Vecchio, where Vasari represented Cosimo I's support of the arts in the Duke's apartments. He

²⁰ V. Borghini, *Carteggio artistico*, 10–13; Summers, *Michelangelo*, 532, n. 27. Borghini recommends, much as Michelangelo had, that sculptors try drawing, painters modeling. The advice has an earlier precedent in Alberti: see CN 38. W. Kemp, "Disegno," 236, cites a similar admonition by Cosimo I. Michelangelo and Pietro Aretino, like Borghini, reportedly dismissed debates on the preeminence of painting and sculpture as a waste of time. Michelangelo's remark occurs in his response to Varchi's questionnaire: "basta che, venendo, l'una e l'altra da una medesima intelligenza, cioè scultura e pittura si puo far fare loro una buona pace insieme e lasciar tante disputa, perché vi va più tempo che a far le figure" (*Scritti*, 523). Aretino remarks that the "disputa fatta più volte che non sono pur marmi e colori nel mondo, ma ghiribizzi di che sculpisce e dipinge . . . dico che ci fatta conte di si contà con quella ch'è tra la provvidenzia divine e la stoltizia umana. (*Lettere sull'arte* 2: 439; see Pozzi, "Note sulla Cultura Artistica," 310). On the Carracci Academy see Dempsey, *Annibale Carracci*.

²¹ B. Mitchell, *The Patron of Art in Giorgio Vasari's Lives*, Chapter 6, "Cosimo I de' Medici as Patron-Hero," stresses Cosimo's support of artists. See also, Rearick, *Dynasty and Destiny in Medici Art*.

²² R. and M. Wittkower, *The Divine Michelangelo*, 44 ff.

stressed the duty of his prince as an exemplar by reference to glorious precedents in the de' Medici family, Lorenzo il Magnifico and Cosimo de' Medici, whose enthusiastic patronage of the arts in the fifteenth century had encouraged Ficino's academy.²³

In form and function, however, Ficino and his circle bore little resemblance to artisans living through the troubled 1560s—except that both groups revived the ancient idea of the academy and both experienced crises in the Church. Perhaps the status of artists in the mid-sixteenth century is best defined by the ideal of reform that Cosimo I fostered in those who sought his patronage and protection.²⁴ According to the historical concept of reform, as it occurs in early Christian writings, the reform of the soul in imitation of God is mirrored on a collective level in the reform of the state. If painting, sculpture, and architecture could be associated with an academy, not only would the privileged status of the artisan who practiced these arts be officially recognized, but his noble art could be supported by works commissioned by the state to educate a universal audience in virtue.

The earliest academy of art began to be realized with Montorsoli's donation of a chapel to house and memorialize the remains of artists for posterity. Meetings of the Florentine art academy were originally scheduled to take place on the Feast of the Trinity in this chapel, thus symbolizing the Accademia's theological conception; and its trinity of the arts of *disegno* could serve as a civic metaphor for the spiritual function of the arts.²⁵ The comparison between the collective state and the microcosm of the human body, teleologically ordered, shaped by the necessity of divine nature (and thus the most worthy subject of *disegno*), runs deeply through the literature on reform long before Vasari made *disegno* the armature for his *Lives* and his conception of the Accademia. Yet perhaps Vasari was more committed to the idea of reform than to the Academy's

²³ According to the historical idea of the Academy that Ficino rediscovered in Plato's *Republic* and others also found in Cicero's *Academica*, the Academy supported research, provided a unified program of teaching, and allowed members a place to dispute, peacefully, to arrive at the truth. On the history of Renaissance academies, see further Pevsner, *Academies of Art*, 1 ff.; Yates, "The Italian Academies," in *Renaissance and Reform* 2: 6–29; Comito, *The Idea of the Garden*. See also, CN 33.

²⁴ A new study of the documents confirms my hypothesis: Ważbiński, *L'Accademia Medicea del Disegno*, 399–402.

²⁵ Summers, "The Sculptural Program of the Cappella di San Luca," 68, n. 4, notes that Borghini employed a neoplatonic commonplace in linking the three arts to the three graces and that both he and Vasari made frequent use of the Trinity in expounding the unity of the arts, which were thus "made the forms of Divine Love."

the scientific literature concerning the proper classification of knowledge.

Whatever the writer's theory, sixteenth-century descriptions of actual artistic procedures are still based closely on conventional explanations that originated in other contexts: in the discussions of scientific methods central to Leonardo's definition of painting, in prescriptions for rhetorical composition first adapted by Alberti, and even in devotional practices described—according to an ancient custom of rhetorical theory—in technical vocabulary borrowed from painters.²⁹ Leonardo himself, whose debt to the natural science of optics was the subject of Chapter Three, injected individual twists into conventional explanations borrowed from a variety of contexts so that nearly every elaboration gives us new insight into the actual relationship between theory and practice. A similar correlation existed between literary precedents and descriptions by Leonardo's sixteenth-century counterparts: even though the descriptions employed conventional formulas, they were colored by current practices.

This interplay between theoretical explanations and actual studio procedures was a central feature of sixteenth-century comparisons of the visual arts. Two professional humanists employed by Cosimo I, his official orator Benedetto Varchi and his court historian Vincenzo Borghini (who acted as official mediator between Cosimo and the *Accademia del Disegno*), set the debate between painters and sculptors into the Aristotelian context of the productive sciences.³⁰ Although Leonardo was not trained in philosophy as Varchi and Borghini were, his defense of painting as a liberal art

²⁹ An excellent example of how the ancient technical model appears in devotional manuals is Ugo Pantiera da Prato's *Tractati* (Florence, 1492): "When the mind has in the end communicated Christ to the imaginative faculties by exercising itself in Christ, Christ will not allow himself to lose the active and corporeal virtue inherent in the spirit. In this first stage, when the mind begins to think about Christ in conformity with the conditions required by Christ, Christ seems to be written into the mind and imaginative faculties; in the second he appears to be outlined; in the third outlined and shaded; in the fourth, colored and lifelike; and in the fifth he seems to be sculptured in the flesh . . ." (cited by Summers, *Michelangelo*, 116). See further Pollitt, *The Ancient View of Greek Art*, 61, 23–26, 62–63; Katzenellenbogen, *Allegories of the Virtues and Vices*, 10 ff., who notes that devotional tracts, such as those by Bonaventure and Hugh of St. Victor, were also widely disseminated sources for depictions of the virtues and vices in debates known as "Conflictus," a visual equivalent to the poetic debates that Leonardo incorporated in his polemics.

³⁰ Borghini and Varchi mediated artists' activities to strike accord between Cosimo I and the *Accademia del Disegno*. See R. and M. Wittkower, *The Divine Michelangelo*; Ciardi-Dupré del Poggetto, "Il Ruolo del Vasari."

and their Aristotelian discussions of the liberal and mechanical arts prove that they belong to a shared intellectual tradition. The similarities do not imply a direct transmission of texts, however, as has sometimes been assumed; indeed, the later arguments overturn Leonardo's central claim for painting, which is that it is a science.³¹ Varchi specifically formulated the problem as one of defining the nature of painting and sculpture as *arte* distinct from *scienza*, and both mid-Cinquecento writers described the didactic function of the arts with reference to moral virtues, not truth and falsehood.³² That is, they addressed the "universal good," not Leonardo's universal, scientific truth linked directly with visual appearance.

Neither Varchi nor Borghini quarreled over the relative status of painting and sculpture; rather, they defended the eminence of both arts by showing how these arts served the state. Borghini distinguished painting and sculpture from the mechanical arts, arguing that painters and sculptors are by nature *imitatrici*, not *fattrici*, because their counterfeiting of a "quality of body or mind" requires an intellectual capacity and can, like oratory, be judged by a universal audience.³³ Varchi divided the arts into Aristotelian categories, assigning all of them to the productive (*fattibile*) intellect and distinguishing the liberal from the mechanical arts according to their relative expenditures of *ingegno* and *fatica*, or mental and physical effort (paired qualities that already appear in Leonardo's arguments). Good artifice, such as the painter's imitation of nature, is the greatest obligation of nature and art and the reason that the liberal arts are favored by princes. Borghini similarly asserted that painting and sculpture are higher than the mechanical arts and yet not as high as those civic virtues which citizens or princes perform for the public good.

But Leonardo, at least in the *Parte Prima* passages, where he defended painting, did not subscribe to the humanist view that painting, like poetry and rhetoric, is liberal for its ability to teach moral truths.³⁴ Leonardo defined painting as natural, not moral, philosophy. The valuation of painting as a science of perspective

³¹ Mendelsohn, *Paragoni*, Chapter 2, "Paragone Sources," concludes that Vasari knew Leonardo's written documents.

³² V. Borghini, "Sulle lettere del Tribolo, del Tasso . . .," *Selve di notizie*, 21, reprinted in *Scritti* 3: 613–630; Varchi, *Lezzione II*, in *Scritti*, 3: 524–530. Quiviger, "Benedetto Varchi and the Visual Arts," 224, notes that Varchi's discussion of painting and sculpture as factive arts was expanded, in 1568, by Francesco De' Vieri.

³³ Borghini, "Summa della Disputa," *Selve di notizie*, 9, in *Scritti*, 3: 672–673.

³⁴ His precepts to painters, on the other hand, often address the subject of figurative decorum. Early statements, closest to his source in Alberti, resemble Alberti's moralizing description of the unity of the *istoria*.

between classifications of knowledge developed by Scholastics and their humanist rivals.⁴⁰ Whereas Leonardo had subordinated the rhetorical components of painting to the science of perspective, sixteenth-century writers did just the opposite: they subordinated perspective to rhetoric and poetry. Pino, Doni, and Dolce did not simply address the rivalry between painting and sculpture, they directed their arguments to the fundamental problem of selecting criteria by which to judge painting. Should artists' work be judged on their mastery of scientific *rilievo* (long associated with Florentine *disegno*), or on the inventive powers of the artist, identified with poetic invention in the Horatian tradition?⁴¹ In other words, did the nobility of painting and sculpture, and their common foundation in *disegno*, depend on their association with the certain sciences, or on their association with letters? Again, should painting and sculpture be judged for their truth of representation of the external world, or for their truth of representation of the artist's unrestrained imagination? Which kind of truth is more elevated?

To state the epistemological conflict another way, for Leonardo the highest pursuit was *scienza*, defined in terms that can be traced generally to medieval interpretations of the scientific arts. Commentaries on Aristotle and Galen, such as Avicenna's definition of a scientific art as one grounded on first principles, and specific sources Leonardo knew such as Pecham's *Perspectiva communis*, provided the foundation for the fifteenth-century definition of painting as *scienza*.⁴² By the mid-Cinquecento, however, a century of established humanist writings beginning with Alberti had lent credence to the rhetorical model of composition. Part of the tension in the sixteenth-century discussions must have resulted from the fact that there was no precedent for defining a discipline with one leg in the mathematical sciences of the Quadrivium and the other in the arts of the Trivium. On what grounds could pictorial artifice be judged in an unorthodox marriage between the Scholastic science of perspective and a humanist definition of poetry? Leonardo's definition of painting on the model of a *scientia media*, in contrast, is based on both mathematics and experience, but it is joined to a higher, mathematical discipline with which it shares first principles.

⁴⁰ Discussed in Chapter Two.

⁴¹ Horace discussed the relationship between *ingenium* and praiseworthy artifice in terms of stylistic as well as moral decorum in the *Ars poetica* (lines 323 ff.). See discussion in CNs 23, 24, 27, 37 and 41. Leonardo also associated invention with poetry, but not when he set out a formal definition of painting. See CNs 13 and 17.

⁴² On Avicenna, see Ottoson, *Scholastic Medicine and Philosophy*, 73. See Chapter Two on Leonardo's definition of painting as a *scientia media*.

However awkwardly his literary description may have reflected actual studio procedures, the painter Paolo Pino stated as clearly as any sixteenth-century writer the tensions that pulled painting in opposite directions. In his *Dialogo di Pittura*, published in 1548 in Venice, Pino based his discussion of artistic procedures on the rhetorical model of invention, disposition, and elocution.⁴³ He subordinated perspective to poetry in a two-stage process of artistic conception and execution based on a rhetorical model. Pino equated poetry with invention, the first category of literary composition, and perspective with rhetorical *elocutio*, or embellishment. He, like his artistic predecessors, argued that painting is a liberal art because it is included with the "four mathematical sciences."⁴⁴ Nonetheless, Pino did not think that a painting should be judged on the art of perspective because, while perspective was an important part of painting, "a picture is really poetry, that is invention, which makes appear that which is not." The "glory of painting" was invention, that is, finding the poetry and *istoria*, and then ingeniously accommodating the subject through the action of the figures represented.

Leonardo praised evident artifice in terms similar to Pino, but since he associated the procedures of painting throughout with perspective, he avoided a conflict over the hierarchy of invention and elocution. According to Leonardo's scheme, *disegno* or the "science of lines" was invention, but *colore* (which included hue and value) and line were both part of perspective. Pino, on the other hand, associated color with invention in poetry apart from perspective. And, Pino elevated "colore" from its longstanding rhetorical association with the superficial ornaments of *elocutio* to designate *inventio*. At the same time as he praised poetry along humanist lines as revealed knowledge, he devalued perspective, traditionally ranked near the summit of the sciences, by associating pictorial perspective (i.e., linear or mathematical perspective), exclusively with embellishment or elocution. He approved of highly foreshortened figures (*scorti*) as pictorial embellishments of this sort, used to draw attention to the painter's skillful mastery of the *difficoltà* of his art (just as difficult figures or tropes, literally "turnings," display the virtuosity of a prose stylist). In his dialogue *Disegno*, published in 1549, the year after Pino's *Dialogo*, Antonfrancesco Doni presented the same conflict between scientific artifice and pictorial

⁴³ First noted by C. Gilbert, "Antique Frameworks for Renaissance Art Theory." See further, Pardo, "Paolo Pino's 'Dialogo di Pittura.'"

⁴⁴ Pino, *Dialogo di Pittura*, excerpted in *Trattati*, 3: 106–108.

Doni's notion of the artist's *disegno* as "the invention of the whole universe, imagined perfectly in the mind from first causes" clearly also refers to God's first intelligible act of creating the world. Yet would not Thomas Aquinas have considered Doni's metaphor heterodox, because only God has the power to create *ex nihilo*? The medieval artist worked analogously to God, but his materials—including the "exemplary form" in his imagination—were given to him by God.⁵² Medieval praise for the artist's inventions is directed primarily to his skill in working his God-given materials. Doni might have meant to state the orthodox view that the artist is receptive to "exemplary forms." But medieval discussions distinguished much more clearly between the noble, passive state of the artist when he receives his idea by coming into contact with God and his active but menial productive state. In the sixteenth century even trained Aristotelians who wrote about the visual arts, like Vincenzo Borghini and Benedetto Varchi, did not make such distinctions.⁵³ Bonds to medieval Scholastic theology had loosened in a number of ways by the time that writers like Doni, Borghini, Varchi, Paolo Pino, Ludovico Dolce, Cellini, and Pontormo—following Leonardo's precedent—identified *disegno*, independently of the religious function of images, as a noble and unifying element that belongs to the artist.⁵⁴

As has long been recognized, Doni promoted *disegno* as the common foundation of both painting and sculpture on the basis of a tradition already claimed by Petrarch, Cennini, Ghiberti, and others—and his discussion is also the immediate precedent to Vasari's famous resolution of the dispute between painting and sculpture in favor of the primacy of *disegno*.⁵⁵ It is less widely

⁵² Leonardo's famous statement of these ideas is Chapter 13 of the *Parte Prima* (see discussion *sub numero*).

⁵³ Aquinas distinguished between efficient and formal cause, which he called "instrumental or secondary" and "principal or primary cause," respectively: see, for example, *Comm. Metaphysics*, L.2: C763–776; see further Saint Bonaventure, *De Reductione Artium ad Theologiam*; Hugh of St. Victor, *The Didascalicon*, discussed in n. 58. Freedberg, *Power of Images*, provides an excellent overview.

⁵⁴ *Disegno* belongs to the artist's active procedures. Varchi, Cellini, and Pontormo discussed *disegno* in texts related to Varchi's questionnaire (reprinted in *Scritti* 3: 493–544). See also Borghini's commentary on Michelangelo's letter to Varchi (reprinted in *Scritti* 3: 626); further discussion in Summers, *Michelangelo*, 228–229; 250–262; 519, n. 49; Ragghianti, "Il valore dell'opere di Giorgio Vasari"; Bernabei, "L'Ombra, la cosa, e il lavoro"; and W. Kemp, "Disegno." An important sequel to these mid-sixteenth-century discussions of *disegno* is Zuccaro's distinction between "disegno interno" and "disegno esterno": see Summers, *Judgment of Sense*, 283–308. See also CN 38.

⁵⁵ Vasari, *Vite*, 1: 43–66 (reprinted in *Scritti*, 8: 1912–1928). W. Kemp, "Disegno," 224–225, cites precedents in Petrarch, Cennini, Ghiberti, Filarete, Doni, and Dolce. Similar statements were made by Pino (reprinted in *Trattati*, 3: 106);

acknowledged that Leonardo's defense of the universality of painting, indebted to medieval writers like Bonaventure and Hugh of St. Victor who identified the principle of art in Aristotelian terms with the maker or artisan, Aristotle's "efficient cause," rests on the same grounds.⁵⁶ Medieval theologians incorporating certain neoplatonic elements distinguished between the craftsman's initial free act of contemplation, in which his active intellectual powers united with God so that the "exemplary form" was made "alive" in him and he subsequently carried out a menial act or operation to produce a useful or delightful object.⁵⁷ Leonardo on the other hand, unlike Scholastic theologians, made no distinction between "exemplary forms" and actual painted images. His distinction between the theoretical and mechanical sciences with respect to the use of mental and physical labor (*ingegno* and *fatica*) referred less categorically to the same theological distinctions through the widely diffused tradition of Hugh of St. Victor's classification of the liberal and mechanical arts (c. 1120).⁵⁸

Pontormo (*Trattati* 3:) 504); and Cellini (reprinted in *Scritti* 8: 1930). See *Parte Prima*, chapters 35–45 and notes *sub numero*; on *disegno*, see also CN 29.

⁵⁶ However, the changing status of the mechanical arts, as studied recently by Summers, *The Judgment of Sense*, 259 ff., emphasizes the importance of mechanical art as a spiritual activity by the thirteenth century.

⁵⁷ "Omnes res . . . in artifice creato dicentur vivere," Bonaventure, *I. Sent.* d. 36, a. 2, q. 1, ad. 4; see further, Bissen, *L'exemplarisme divin*, 29 ff.; CN 8; Panofsky, *Idea*, 40, on Thomas Aquinas' characterization of the artist's "quasi-idea" as analogous to the working of the divine mind; and R. Wittkower, "Genius." The Christian transformation of Aristotle is indebted to the Neo-Pythagorean theory that all things participate in God, the cause of harmony (*consonantia*), which orders all creatures to one another in a vertical hierarchy so that "all things are in all" and all things are ordered to one and the same final cause. Nearly the same phrase, "all in all and all in every part," is a leitmotif occurring throughout Leonardo's writings that he may have known from optical treatises, for it suggests al-Kindi, one of Roger Bacon's sources (Lindberg, *Theories of Vision*, 176). On Leonardo's sources in Roger Bacon, see Strong, *Leonardo on the Eye*, xix.

⁵⁸ See Taylor, Introduction to *The Didascalicon of Hugh of St. Victor*, 3–39; Ovitt, *The Restoration of Perfection*, 117 ff., for the historical context of Hugh's classificatory scheme, which is more complete than the brief discussion here can indicate. Among Hugh's important successors are Bonaventure, (*De Reductione artium ad theologiam*, c. 1250), Robert Kilwardby, *De ortu scientiarum*, c. 1250), and Thomas Aquinas, whose division of the sciences borrows important elements from the classification of al-Farabi (translated into Latin c. 1150). The distinction between physical and mental labor may derive from Galen's classification of the arts according to the amount of physical effort required. Hugh followed Aristotle's scheme of the theoretical practical and productive sciences, which he called "mechanical," with reference to the works of nature. Devaluations of the methods of artisans can also be traced to Vitruvius, who seems to have been one of Leonardo's sources for the definition of practice founded on theory, and Plato, who used the negative connotation of "instrument" metaphorically to distinguish between two kinds of imagination, one praiseworthy and the other reprehensible (Bundy, *The Theory of Imagination*). A recent reevaluation of the medieval mechanical arts in relation to medicine is found in Ottosson, *Scholastic Medicine and*



III. 16. 'First' design for Michelangelo's Catafalque in San Lorenzo. 1564. Pen and ink with wash. Codex Resta. Milan, Biblioteca Ambrosiana.

views on the new theoretical, mechanical sciences. Using medieval distinctions but in diametric opposition to medieval classifications of painting, Leonardo argued that painting is not a mechanical art, because *disegno*, like all liberal arts, derives not from physical labor but from *ingegno* or mental speculation. One of the main differences between Leonardo's writings on the comparison of the arts and later arguments is that later writers clarify these issues by crystallizing the language into neat definitions. For example, Leonardo claimed that painting vies with poetry and sculpture (in its descriptions of battles and landscapes, for example, and figures conceived on a sculptural model). But only in the mid-sixteenth century did writers thematize these formal concerns by inventing concrete symbols (like personifications of the individual arts), or conceiving general categories (like *disegno*) to subsume the rival arts of painting and sculpture.

Whether the arguments originated in the studios of artists, as many of them must have, or bear the unmistakable imprint of humanist literary polemics or Scholastic disputations, Renaissance discussions of art owe a great deal to Aristotle's analogy that art is, like nature, an orderly sequence of intelligent actions carried out for the sake of some purpose or end (*Physics* 199a).⁶³ In the mid-sixteenth century, critical issues that Leonardo and other writers like Alberti and Lorenzo Ghiberti had formulated on the basis of this analogy (drawing upon a range of scientific and literary sources) were frequently reduced to a contrast between two kinds of artifice, art produced by nature and art produced by man. This simple ratio could be readily illustrated in visual form, as in the program Vasari devised for his own houses, or the decorations for Michelangelo's funeral (Figure 16) which seem to be among the earliest examples.⁶⁴ If Condivi's report of 1553 is not a mid-century embroidery, then the genre may have originated with Michelangelo himself, in his 1505 design for the tomb of Julius II where statues bound like captives represented the liberal arts: "and likewise Painting, Sculpture, and Architecture, each with her symbol so that they could easily be recognized; denoting by this that, like Pope Julius, all the virtues were prisoners of Death, because they

⁶³ Summers, *Michelangelo*, 313–314.

⁶⁴ On Vasari's houses, see Jacobs, "Vasari's Vision of the History of Painting"; Cheney, *The Paintings of the Casa Vasari*. W. Kemp, "Disegno," 229, cites related examples by Francesco Bocchi and Federico Zuccaro. On this new iconographic tradition, see also McGrath, "The Painted Decorations of Rubens' House"; and Kubler, "Vincente Carducho's Allegories of Painting." R. and M. Wittkower, *The Divine Michelangelo*, give illustrations of personified allegories for Michelangelo's catafalque.

would never find such favor and nourishment as he gave them."⁶⁵ Condivi's description may also have inspired the program for Michelangelo's funeral, which included allegories of painting, sculpture, poetry, and architecture on the catafalque. A tablet held by the allegory of Sculpture, inscribed with a message from Boethius, referred to the world God "fashioned in his own image and likeness" ("simili sub imagine formans," *De consolazione*, 3.9.8).⁶⁶

By the mid-sixteenth century, the physical processes of sculpting and painting became similitudes of higher labors. When the making of art became itself a visual subject, it was an obvious sign that painting and sculpture were no longer considered mechanical labors. The new visual personifications of the arts had been preceded by modern literary allegories such as the debate between "Nature" and "Art" in Doni's *Disegno*, which transformed ancient and medieval allegories like Lucian's "Dream" or Boethius's *Consolation of Philosophy*. And, in fact, the *Parte Prima* monologues belong to the same tradition; they are not autobiographies but sophistic literary fictions, delivered in the *persona* of a painter who transformed conventional poetic formulas into simulated debates against (imagined) representatives of the other arts.⁶⁷

Leonardo's arguments approached those of later Renaissance writers most closely by identifying actual artistic procedures with the artist's intellectual activities. But sixteenth-century writers including Doni, Vasari, Francesco Sangallo, Cellini, and most importantly, Michelangelo, were the first to praise the physical effort involved in sculpting, which they discussed in terms of *disegno*. Apparently, in the process of formulating a language for art, these writers of Vasari's generation reallocated the primary association of "disegno" from mental activities associated with painting to those associated with sculpture. To put this another way, sculpture, or painting defined on the model of sculpture, became the favored paradigm for discussing artistic procedures in a theoretical context. In his resolution to the rivalry of painting and sculpture on their common foundation in *disegno*, Vasari, in the Preface to the *Lives*, likened *disegno* to a "rough sketch" used in carving marble or

⁶⁵ Translation is cited from Hibbard, *Michelangelo*, 86. The fundamental study of this project is Panofsky, "The First Two Projects of Michelangelo's Tomb of Julius II."

⁶⁶ This scene depicted Michelangelo deliberating with sculpture; see Wittkower, *The Divine Michelangelo*, 102. Mendelsohn, *Paragoni*, 80–83, describes the tripartite design of the catafalque.

⁶⁷ Curiously, Leonardo hardly ever acknowledges, and never extols, the virtues of his profession as sculptor or architect.

modeling in clay.⁶⁸ Like Vasari, Leonardo had identified *disegno* in both sculpture and painting as the "science of lines."⁶⁹ But Leonardo never mentioned *disegno* in connection with sculpting as a preliminary process of the hand, working in conjunction with the *fantasia*. He compared low relief to pictorial perspective, but in contrast to later, sixteenth-century writers, he did not connect sketching with direct carving. Rather, he described carving in terms close to Alberti's *De statua* as a mechanical process of defining contours by means of measurement and direct visual experience.⁷⁰

At a deeper level, however, in which the hand acted as an instrument of the soul, Leonardo still shared with Vasari and his contemporaries the association of *disegno* with the imagination or *fantasia*'s power to manipulate plastic form. Ultimately, these Renaissance discussions are indebted to Aristotle's conception of the *forma agens* as the active part of the mind that is identical with its

⁶⁸ Vasari, Preface to the *Lives*, ed Barocchi and Bettarini, 2: 3–4. See also Summers, *Michelangelo*, 203–233, citing Varchi; 276–278, citing Cellini. Vasari discussed methods of sketching, modeling, fixing images in the memory and drawing from the imagination to bring works to perfection—similar to those mentioned in many passages of Leonardo's *Trattato* in the Introduction on painting added to the 1568 edition (1: 111–113; excerpted in *Scritti* 8: 1912–1920). Cellini wrote at length on the use of models preliminary to drawing, in his *Sopra l'arte del disegno*, (*Scritti* 8: 1929 ff.), where his discussion of *iudizio* in terms of positioning limbs in movement distinctly recalls Leonardo (see CN 39). Dolce's rhetorical categorization of painting (*L'Aretino*, 139) makes room for drawing based on knowledge of proportion, which calls for good judgment "di modo," that is, in the process of inventing the *forma*. Varchi (*Scritti*, 1: 29) distinguished between the first *disegno*, or *schizzi*, and colored and perfect figures: the former proceed essentially and correspond to definition; the latter proceed accidentally and descriptively. Borghini, commenting on Tasso's letter to Varchi (*Scritti*, 3: 617), likewise praised *disegno* in these terms, giving priority to sculpture, when he cites Michelangelo, who made "il disegno con modello senza disegnare in carta." On the actual use of models, see Lavin, "Bozzetti and Modelli."

⁶⁹ Vasari's discussion may derive immediately from Vitruvius; see W. Kemp, "Disegno," 225. Leonardo also refers *disegno* to the science of *chiaro e scuro*, which belongs to painting and is shared in part with sculpted relief, which employs foreshortenings. See discussion of CN 37. "Science of lines" in Leonardo's writings designates either simple perspective (or, alternatively, astronomy) or drawings of the cords of muscles observed in dissection (on the latter, see Schultz, *Art and Anatomy in Renaissance Italy*, 77 and 87).

⁷⁰ Compare, for example, Alberti, *On Sculpture*, ed. Grayson, 139 (*De Statua*, section 13) and *Parte Prima*, Chapter 37. See further discussion of Leonardo's views on carving at CN 38. Most of these arguments were composed around 1492 in Milan, but even if others are datable as late as 1508–1510, Leonardo never acknowledged an awareness of Michelangelo's innovative procedures. Varchi notably cited only the precedents of Castiglione and Alberti in his discussion of the rivalry of painting and sculpture (*Scritti* 3: 525). See further, Chapter One, n. 50. Kenneth Clark hypothesized that Leonardo's polemics were directed against his archrival (*Leonardo da Vinci*, 1939, 56). Leonardo and Michelangelo were in direct competition in the Sala del Consiglio of the Palazzo Vecchio, ca. 1503–1505, a subject that deserves further attention.

object in the case of “things without matter,” such as the abstractions of mathematics and the affections of sensible things which reside in sensible forms (*De anima* 430a55 ff.). In speculative operations, according to Aristotle, that which thinks and that which is thought are the same. Images take the place of direct perception for the thinking soul: the soul acts like a hand, an instrument that employs instruments. In the same way, mind is a form that employs forms and sense employs the forms of sensible objects.

Elaborating on Aristotle in the general preface to his annotated edition of Vitruvius’s *De architectura*, first published in 1556, Daniele Barbaro devoted an extensive discussion to the term “arte,” a discussion that is in a sense the direct successor to Leonardo’s defense of painting as a science based on both principles and experience, theory and practice.⁷¹ But whereas Leonardo had merely remodeled scientific discussions of method to *define* painting as a science, Barbaro was concerned with explaining *how* artists translate their mental deliberations into their work during the act of fabrication. Barbaro’s definition of “arte,” composed towards the end of the period of active rivalry between painting and sculpture, is perhaps the first attempt to articulate a general theory of artistic creation.

It is important to bear in mind that Barbaro’s readers would have expected remarks addressed to the patron in his preface to Vitruvius’ treatise on architecture. Vitruvius had dedicated his work to his sovereign, and the custom had been carried on by Renaissance writers of architectural treatises like Alberti and Filarete. The absence of such a dedication might, therefore, have been a political statement. Whether or not this was the case, it can reasonably be assumed that Barbaro’s readers would have seen his point clearly from the argument itself.⁷² Barbaro drove a wedge into the Quattrocento notion of decorum that defined the patron as the artist and the work as an exemplification of the patron’s character. In his view (in an argument that suggests that the notion of patron as the “maker” or “artist” still had currency), the term “artist” pertained only to those who actually fabricated things.

Barbaro avoided explicit criticism of the patron, but he neatly excised all “experts” from any direct contribution either to the

⁷¹ Barbaro, ed. and trans., *I Dieci Libri dell’Architettura di M. Vitruvio*, 1567, 2–5; all references are to this edition). For a concise assessment of Barbaro’s preface, see Wittkower, *Architectural Principles*, 65–69.

⁷² Compare Vitruvius, *The Ten Books on Architecture*, Preface; the same formula was used by Filarete, and similar dedications are found in many humanist writings. Pacioli seems to have been the first to dedicate a treatise on architecture to artisans (*De divina proportionem*, Chapter 54).

work or to its significance, dismissing all varieties of opinion, together with suspicion and credulity, as forms of ignorance.⁷³ In Aristotelian terms that would have been familiar to any educated reader, he distinguished between experience as a principle of discovery and "Arte," not as rhetorical skill or *techne* associated with *elocutio*, but as a universal principle that is discovered by way of the senses.⁷⁴ Barbaro added idiosyncratic inflections to Aristotle, moreover, in defending the artist's special expertise. He claimed that the craftsman errs and sins often enough, not because he does not know, nor because his reasoning (*ragione*) is less true, but because he is not sufficiently experienced to know how to make the defects of the material respond to his artistic intentions. The intelligent craftsman, however, is more ready to resolve and account for these things than either the "simple" man or the inexperienced "expert." There are, according to Barbaro, two kinds of experience, of which one kind (i.e., skill) is "acquired by art" and the second is "aroused" (*destare*) or "excited" (*eccitata*) by art.⁷⁵ This kind of experience evokes the *ragioni* of art exercised, for example, by craftsmen who leave what they have found to posterity, or by inventors who find principles without exchange of labor, "so one can say that half the deed is to begin well."

In this argument, Barbaro transformed to his own purposes Aristotle's well-known distinction between art and experience in

⁷³ Barbaro, *Vitruvius*, 3: "... suspicion and credulity, which turn the mind from truth and twist it to stop on falsehood, as if some were disposed to false principles . . . and this bad habit we call Ignorance."

⁷⁴ The argument is based on Aristotle's explanation of how universals arise from experience (*Posterior Analytics*, 99b35–100a9), and Barbaro differentiates between prudence and art in terms that ultimately originate in the *Nicomachean Ethics* (1140).

⁷⁵ Barbaro, *Vitruvius*, 4–5. Barbaro defined the first kind of experience as "what is acquired by Art" (*che s'acquisti l'Arte*). The second kind of experience is "what is excited, and it is born from art, [it is] what is discovered in us, and according to the causes of art we exercise it" (*che è eccitata, et desta dall'arte, che si truova in noi et secondo le ragioni dell'arte la esseritiamo*). Barbaro's explanation of both kinds of experience is indebted to Galen's classification of the arts according to the amount of physical effort involved. This discussion recalls Galen also in its emphasis on reasoned experience (see the introduction to the Commentary Notes on the mechanical arts, on Galen's *experientia ratione*). Similar distinctions had been voiced much earlier, by late fifteenth-century humanists like Rudolf Agricola who wrote, around 1479, that the theory of writing, like painting, was no good without practice: "a painter may have read or heard a great deal about the theory of forms, on how one represents with a configuration of lines projecting or receding forms. . . . Even though he may have learned all these things from a teacher, unless he himself puts hand to panel and makes many trials, he will, however hopefully he began, waste much toil" (as translated by Baxandall, "Rudolf Agricola and the Visual Arts," 413–414, citing *De inventione dialectica* [Venice, 1561], noting the influence of Alberti's treatise on painting).

the *Metaphysics* (981b). His terms also immediately bring to mind another text based on Aristotle's distinction that, as we have already seen in Chapter Two, was important to Leonardo, namely Galen's discussion of the eye in the tenth book of *De usu partium*, where Galen praises the artificer who can explain his art. Barbaro maintained that the *artefice* could teach his art to others since he understood its *ragioni*, whereas the "expert" lacked the *ragioni* of practicing artists.⁷⁶ In fact, the "expert" was in a position no better than Aristotle's manual laborer, because the expert's "demonstrations do not extend beyond sense and extend only to the mode of seeing the conjunction of his own opinion with those of others, and this act is a servile, imperfect duty, far from the duty of *Arte*."

Barbaro's opinions had immediate practical consequences: they were cited in at least one actual sixteenth-century confrontation between artists and patrons.⁷⁷ In 1569, disputes arose concerning a sculpted tympanum of the Annunciation planned for the facade of Milan Cathedral. Archbishop (then Cardinal) Carlo Borromeo had appointed Pellegrino Tibaldi architect of the Cathedral in 1567. Pellegrino's composition for the Annunciation relief, made from a normative point of view in the interests of greater legibility for the spectator at ground level, angered local artists, one of whom, Martino Bassi, published a polemical tract on the subject in 1572, entitled *Disparei in materia d'architettura e prospettiva*.⁷⁸ Bassi borrowed Barbaro's argument and also published opinions from other practicing *artefici* (Vasari and Palladio were among his most loyal supporters). The annals of the Cathedral record a debate between Bassi and Tibaldi held in 1569, which was settled by a vote of the "Deputati della Fabbrica," or building committee (which included Borromeo). Pellegrino Tibaldi was granted a total victory and ordered to execute his work without any changes whatsoever.

⁷⁶ Barbaro, *Vitruvius*, 2–3, defines "Arte" as the habit most closely associated with wisdom and the habit which is concerned with contingent truth because "things made by man depend on their works." This argument, although it by no means repeats its precedent, generally proceeds from a framework for discussing the Aristotelian productive sciences established by medieval writers, now formulated in more classical language and comparable to discussions by Benedetto Varchi and Vincenzo Borghini. See also Summers, *Michelangelo*, 203–223; *Judgment of Sense*, 227–230.

⁷⁷ The following incident is discussed by Bora, "La prospettiva della figura umana."

⁷⁸ See the Consolidated Bibliography; the argument is excerpted in *Scritti*, 8: 1799–1801, with references to scholarship and related documents in the church annals. The letters by his respondents, including Palladio and Vasari, are included in the same volume published by Bassi in 1572, pp. 35–51.

It is easy to empathize with Bassi's frustration with the Church authorities when he explained that his plan for the Annunciation relief (Figure 17), constructed *sottinsù* with a single horizon line determined by the spectator's position, was based on the correct diminution of perspective, the way "cose naturali" were seen, according to the laws of optics formulated by Euclid and Witelo.⁷⁹ On these scientific principles, Bassi claimed (and Vasari and Palladio defended him), famous works by Giulio Romano, Peruzzi, Mantegna, and Raphael had been constructed. In contrast, Pellegrino's solution of rendering a foreshortened view by two horizon lines (Figure 18) had been arrived at "by accident rather than by art," and for these reasons his relief was disproportioned and filled with other "evidenti difetti."⁸⁰

These are all familiar "paragone" arguments taking different sides in a debate on the value of evident artifice. Bassi reiterated Leonardo's position that the artifice of painting, based on perspective, is truthful because it is grounded in mathematical principles and experience. Bassi tried to answer his opponents' objections by distinguishing between the aims of painting and sculpture, claiming that low *rilievo* is closer to painting. His argument that "la fittione è propria de la pittura, ma non de la scultura," a classic adjudication in favor of painting, calls attention to the issue of artifice.⁸¹ His reasoning recalls Leonardo's diatribe against sculpture: sculpture in the round lacks the artifice of painting because its *rilievo* is formed by nature. One of Bassi's respondents, Giovanni Battista Bertani, claimed that natural relief was true while perspective was "a lie and fiction," even though previous artists like Donatello had "stupefied all worthy and learned men with such art."⁸² Bertani echoes Doni who, at the conclusion of his dialogue *Disegno*, cites Michelangelo's opinion that sculpture is more worthy because it is closer to nature.

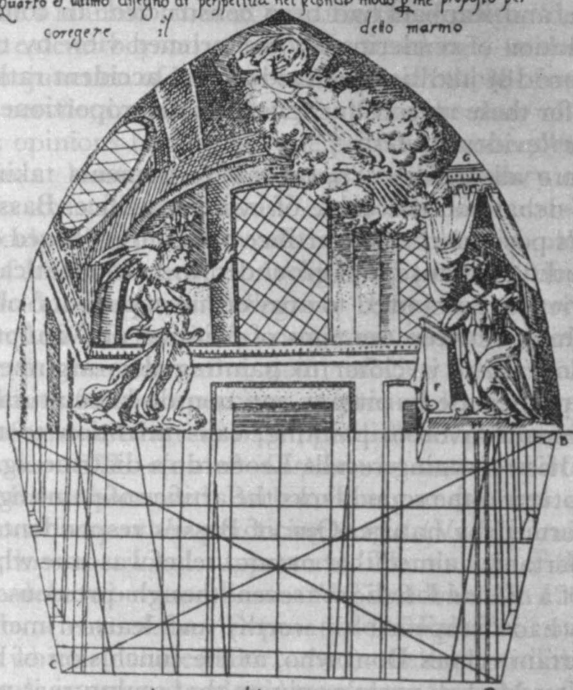
⁷⁹ Bassi, *Disparei*, 15 ff. Euclid's *Optics*, known previously in a medieval recension, was first translated into Italian expressly for artists by Egnazio Danti, who taught mathematics at the Accademia del Disegno in Florence: Danti's *Le Scienze Matematiche Ridotte in Tavole*, Bologna, 1577, begins: "Prefazione dell'eccellenza delle matematiche, ove si dimostra quanto elle siano necessarie all'acquisto di tutte l'altre arti liberali" (facing p. 1).

⁸⁰ Bassi, *Disparei*, 15r and 52r.

⁸¹ Bassi, *Disparei*, 18. Compare Doni, *Disegno* (in *Scritti* 3: 590–591), where "Scoltura," has the last word: "Mettete adunque silenzio a questo regionamento, perché in verità la pittura ebbe principio dall'ombra e la scultura dal vero; e quel che s'e mancato di dire in questo primo libro, o di risolvere pienamente, nel secondo si sodisfarà."

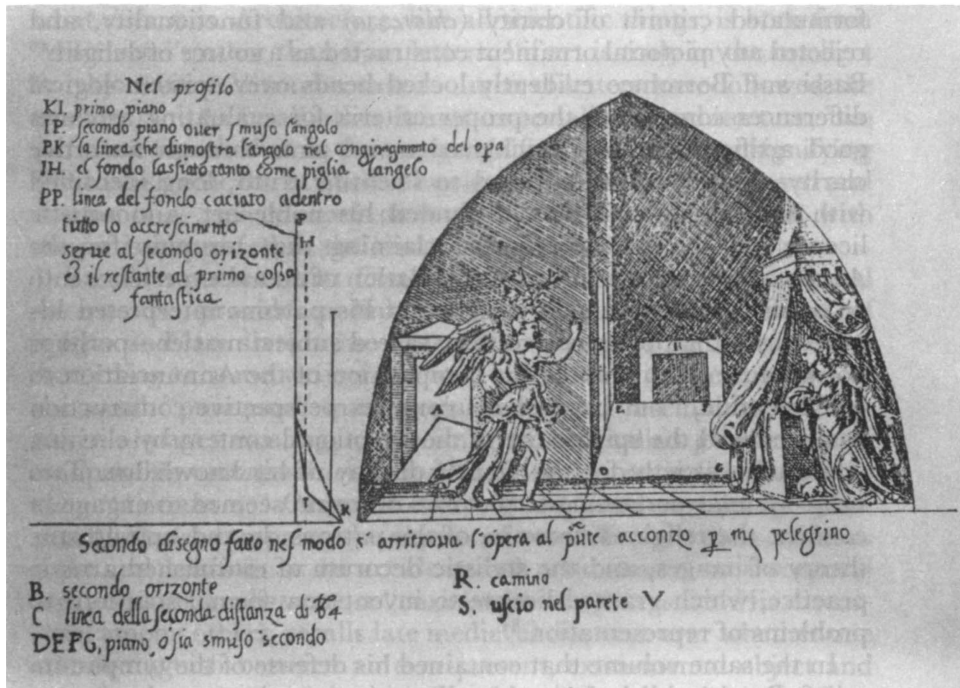
⁸² Bassi, *Disparei*, 51.

Quarto e ultimo disegno di prospettiva nel secondo modo ^{il} me proposto per
 correggere il detto marmo



A.B. linea piena del marmo
 A.C.B.D. linee orizzontale
 B.C. linea della distanza
 F.P. archetia rastremata
 G. cortiugio
 se linee oculte disegnano il piano
 otgrado al ingiù
 il rimanente è per se chiaro

Ill. 17. Martino Bassi. Bassi's own design for the Annunciation relief, Milan Cathedral. From *Disparei in materia d'architettura et prospettiva*, Florence, 1572.



III. 18. Martino Bassi. Analysis of the perspective construction in Pellegrino Tibaldi's Annunciation relief for Milan Cathedral. From *Disparei in materia d'architettura et prospettiva*, Florence, 1572.

Bassi's claim that art is based on *ratio* would have been admired by later fifteenth-century patrons and artists who approved of displays of skill grounded in scientific knowledge without reservation. The Cathedral building committee, on the other hand, strongly objected to scientific artifice at the expense of narrative clarity. Bassi, in fact, defended artistic license in terms that Borromeo attacked when he applied the decrees of the Council of Trent to church building practices, in his *Instructionum fabricae ecclesiasticae et superlectilis ecclesiasticae libri duo*, composed around 1572. Borromeo formulated criteria of clarity (*chiarezza*) and functionality, and rejected any pictorial ornament constructed as a source of delight.⁸³ Bassi and Borromeo evidently locked heads over epistemological differences concerning the proper criteria for evaluating art: was good artifice that which achieved moral aims through narrative clarity, or that which adhered to scientific truth, long identified with artistic license? Bassi defended his noble art, and artistic license, on scientific principles, claiming that his plan for the *Annunciation* was an admirable translation of actual experience into an artificially constructed image. But his patrons interpreted his practices as inappropriate to their sacred subject matter—perhaps not because Bassi wanted his composition of the *Annunciation* to be “scientific,” but because his complex perspective construction compromised the spirituality of the devotional content by eliciting admiration strictly for the artist's display of his knowledge. Two value systems pertaining to pictorial decorum seemed to engage in conflict: the religious decorum of the patrons, bound up with the theory of images, and the stylistic decorum of established artistic practice, which granted license to invent new formal solutions to problems of representation.⁸⁴

In the same volume that contained his defense of the tympanum relief, Bassi published another dissenting opinion, on the square form planned for the Baptistry. Bassi's two discussions clarify one another, and in conjunction demonstrate how epistemological conflicts were manifested in actual disagreements between practicing

⁸³ Borromeo, *Instructionum fabricae*: “Parerga, utpote quae ornatus causa imaginibus pictores sculptoresve addere solent, ne prophana sint, ne voluptaria, ne deliciosa, ne denique a sacra pictura abhorrentia, ut deformiter efficta capita humana, quae *mascaroni* volgo nominant, non aviculae, non mare, non prata virentia, non alia id generis, quae ad oblectionem deliciosumque prospectum atque ornatum effinguntur . . .” as cited in *Trattati* 3: 44, and n. 4. Summers, *Michelangelo*, 498, discusses Borromeo's Vitruvian restrictions on pictorial decorum.

⁸⁴ Shearman, *Mannerism*, 168, calling attention to the Council of Trent's 1564 condemnation of “superfluous elegance,” characterizes evident (stylistic) artifice in religious art as a “double offense against the classical concept of decorum.”

artists and patrons who followed directives issued by the Council of Trent. Bassi's second discussion, which credits Daniele Barbaro along with Vitruvius, is sometimes difficult to follow, perhaps because he understood his sources imperfectly, but it is clear that he defined "arte" as a habit that produces its operations with *scienza*. Like Barbaro (and Leonardo), he laid particular stress on the importance of deliberation. According to Bassi, every *sgrossamento* ("rough-hewing") is born from fabrication and ratiocination, which depend on knowing beforehand what *fabrica* is and what *discorso* is. Architecture, like all scientific things, is born from "discourse" rather than from letters: "if art is truly in the intellect for the reasons Vitruvius says . . . men of letters have followed the shadow. . . . As in all other things, especially in architecture, two parts are found, that is, the thing signified and the thing signifying ('la cosa significata, et quella che significa'), the work proposed and the proof . . . every work directed by reason and finished with *disegno* is impressed in the sign of the *Artefice*."⁸⁵

Bassi's argument that *fabrica* corresponds to the artist's mental *discorso* also provides a link between Leonardo's discussions of *ingegno* and late sixteenth-century descriptions of the imagination. According to some writers—among the earliest to use cognates of the word "paragone" in a specialized sense, resembling modern usage—images existing in the imagination, called *phantasma*, are comparable (*paragonabile*) to optical illusions, poetic similitudes, or even "discourses." Cesarotti claimed that whenever the imagination (*fantasia*) compares the objects of two different senses, such as sight and hearing, or an accident and a substance, or a corporal and a spiritual substance, a "curious discourse" results. His discussion, among others, recalls late medieval disputes over whether one can distinguish between an ever-present, extra-mental object and an after-image remaining in the *fantasia* in the absence of an external object.⁸⁶ At the end of the sixteenth century, as in the fourteenth century, such a comparison was said to take place in the material part of the mind, since one term of the comparison originates in the external world, and the other exists only in the inner sense of the imagination. The exemplary function of art pertains in the same manner. Barbaro and Bassi imply, to the relationship between the artist and his work. By granting the artist

⁸⁵ Bassi, *Disparei*, 32–33.

⁸⁶ On Cesarotti, Delfico, Pallavicino, and other late sixteenth-century writers who used cognates of "paragone" in this specialized sense, see the entry for "paragonabile" in Battaglia, *Grande Dizionario*. On medieval issues, see Tachau, "The Response to Ockam and Aureol's Epistemology."

new responsibility to translate his mental deliberations into his work during the act of fabrication, this argument transforms the medieval view (and also Leonardo's polemic that mental deliberations alone ennoble products of art) that the artist simply receives his exemplary forms from contact with God's first intelligible act. As we have already suggested in Chapter Three, this grants power to the artist's scientific imagination, not to his poetic license to invent impossible fictions.

Postscript

Leonardo's contention that painting is a "universal language" because images are constructed on the same principles that explain the act of direct vision is one of the first of many such arguments which have remained at the center of debates on the nature of representation until our own time. Provisionary evidence of the interaction between art and science in the later sixteenth and early seventeenth centuries points to unresolved and significant issues concerning the function of images in devotional practice and more generally, the status of art as a form of knowledge.⁸⁷ It would be well worth examining why painting was defined on the model of an investigative science in the post-Tridentine period. At the same time, writers increasingly discouraged pictorial ornament involving difficult feats of projective geometry (such as drastically foreshortened figures), preferring conventions that seemed, to ecclesiastical patrons, to emphasize devotional content rather than call attention to human artfulness.⁸⁸ The literary and visual record suggests that artistic imagination was redefined in absolute terms at this time to direct artists away from capricious fantasies and toward formal qualities like the natural *bellezza* of color. Artistic invention prac-

⁸⁷ As also noted by Bell, "Cossiano dal Pozzo's Copy," 124, as recently as 1961, James Ackerman claimed that "art was as little use to scientists in the seventeenth century as scientific discovery was to the artists" ("Science and Visual Art," 68). This view still has currency, and traditionally historians have avoided studying the relationship between art and science in the early modern period.

⁸⁸ In addition to the controversy over the sculpted tympanum planned for Milan Cathedral, M. Kemp, *The Science of Art*, 96, cites Cigoli's *Virgin of the Immaculate Conception* inside the dome of the Pauline Chapel of Sta. Maria Maggiore, shown *in faccia* rather than *in scorcio* to serve "the needs of lucid exposition at the expense of the simple and consistent deception of the eye." Many writers attest to this trend in the religious decorum of images. Ludovico Dolce and critics of Michelangelo's *Last Judgment* like Giovanni Andrea Gilio made similar claims, which proliferated in the seventeenth century as criticism of *maniera* which departs from verisimilitude. The distinction between praiseworthy optical effects and those deserving condemnation for the way in which the artist abuses his imaginative powers to subvert the audience deserves further study.

ticed in these terms did not compromise or obscure and, indeed, it strengthened the ideology of the Church by utilizing the newly emerging physical sciences. Praiseworthy artists demonstrated that events described in Holy Scripture, such as visions of saints and other supernatural phenomena, were compatible with the real world of experience.

Leonardo's theory has a central place in Western thought as a whole not only because it drew from classical sources but also because it remained vital and influential in its own right for centuries. The scientific literature of art potentially provides new insight into the ways that Leonardo's artistic successors interpreted his theories in practice, whether they knew his writings directly or only the textual tradition to which his scientific conception of painting belonged. For Leonardo was by no means the only writer to define painting as a mathematical science, nor was there anything radically new about a scientific program of art education in the late sixteenth century.

PART TWO

THE *PARTE PRIMA* OF THE
CODEX VATICANUS URBINAS 1270

INTRODUCTION

Physical Features of the Manuscript

The *Parte Prima* of the *Codex Vaticanus Urbinas 1270* is a unique text. It forms the first of eight parts of Leonardo's "Treatise on Painting," a document of major importance because it is the first interpretation of Leonardo's literary remains. The *Codex Urbinas* is the oldest and most inclusive version of this compilation, the archetype of all other copies. The only other manuscript that includes the *Parte Prima* is a copy made from the *Codex Urbinas* by Giuseppe Bossi around 1810.¹

The *Parte Prima* comprises the first 28 folios of the *Codex*, which consists of 335 leaves of paper in small folio (15 × 20.4 cm.), in a nineteenth-century vellum binding with a brown paper label on the spine stamped in gold "URB. 1270." with the coats of arms of Pius IX and Ant. Testi, Cardinal Librarian of the Vatican Library. The script is light orange-brown, in a clear, even, legible sixteenth-century hand, with corrections in a darker script of broad ductus. There are marginal notes and stress marks, using ink generally dark but varying in color, in a smaller script of fine ductus that Kate Steinitz described as an "intellectual's hand" rather than that of a "professional scribe."² The bottom three-quarters of folio 27 verso is blank, and is followed by two passages on folio 28 which, according to a note on folio 28 verso added by the editor (transcribed in the critical apparatus and translated at the end of the translation), were found after the rest of this section was compiled. The *Parte Seconda* begins on folio 29.

¹ Bossi's copy, now in the Ambrosiana Library in Milan, was made under the supervision of Abate Gaetano Luigi Marini, custodian of the Vatican Library. Bossi's plan for a new edition of the *Trattato* was never realized; see Pedretti, *Commentary*, 1: 43. According to Pedretti, there is no evidence that the *Paragone* was known in any other compilation (Pedretti's two most extensive discussions of the *Paragone* are found in *Libro A*, 121–128; and *Commentary*, 1: 76–86). However, Pedretti (in *Leonardo e Leonardismo*, 230) cites evidence that an eighteenth-century artist knew the *Codex Urbinas*. A list of manuscript copies is given by Steinitz, *Leonardo da Vinci's Trattato*, 37–138. Although the present account relies on the authoritative assessments of an extensive group of manuscripts published by Pedretti and Steinitz, the *nachleben* of Leonardo's writings is far from sorted out.

² I cite the description of Steinitz, *Leonardo da Vinci's Trattato*, 39 ff., verified by personal autopsy of the physical document.

History of the Compilation

The existence of the *Codex Urbinas* is first recorded in an inventory of books in the possession of the last Duke of Urbino, Francesco Maria della Rovere, made on June 6, 1631 (the year after the Duke's death).³ The only evidence of Renaissance plans to publish the *Codex* is the emendations of the sixteenth-century editors and, possibly, some vague remarks by Vasari.⁴

After the Duke's death, the manuscript came into the possession of Pope Urban VIII and was transferred to the Vatican in 1657, during the pontificate of Pope Alexander VII. At the turn of the nineteenth century, probably in 1797 when it was catalogued with the number 1270, the *Codex* was rediscovered in the Vatican Library.⁵ The *editio princeps* was published in Rome in 1817 by Guglielmo Manzoni, who added to the *Parte Prima* the title "Paragone" by which it has been known ever since.⁶ In 1873 Max Jordan published the first critical study of the manuscript, followed shortly by Heinrich Ludwig's scholarly edition of the *Trattato*, published in 1882 with additions in 1884 and 1886. Ludwig's edition is the foundation for all subsequent scholarship. English translations of the *Parte Prima* have been published twice, by Irma Richter in 1939 and 1949 with a critical transcription, and by A.P. McMahon in 1956, with a facsimile. Many of the passages are available in Paola Barocchi's modern anthologies of sixteenth-century texts.⁷ The

³ When last catalogued in 1640 in the della Rovere library, the codex was in Castel Durante, not Urbino: see Carusi, "Per il 'Trattato della Pittura,'" 430, n. 4. On the history of the manuscript, see Pedretti, *Libro A*, 95-97, and, for the most recent discussion, Pedretti, *Commentary*, 1: 12-13; see also Steinitz, 39-43, and the following note.

⁴ See further discussion in Pedretti, *Commentary*, 1: 12-13; Marinoni, "I Manoscritti"; Rosci, "Leonardo 'filosofo,'" 59-60, reviewing the scholarship concerning the dating of the compilation. Clark, "Francesco Melzi," 24-25, suggests that Leonardo could have assisted Melzi but, as Rosci notes, the organization suggests a mid-sixteenth-century date.

⁵ The most complete history of the *Codex Urbinas* is that given by Ludwig, ed., *Leonardo da Vinci*, 1882, 3: 1-14.

⁶ Full references to Manzoni's first edition and the studies cited in the following text are given in the Consolidated Bibliography. A second edition was published by Manzoni, *Tratto della pittura di Leonardo da Vinci con aggiunte Trattate da Codice Vaticano*, Milan, 1859, the "Introduzione" of which is excerpted from the *Parte Prima*.

⁷ *Scritti*, 1978, 1-4, 6. Most recently, a partial translation has been edited by Kemp, *Leonardo on Painting* (1989). The editions of Richter, McMahon, and Kemp also rearrange the original order of the texts. There is one other English translation known to me, the unpublished dissertation of Rusk, "The Paragon of Leonardo da Vinci," which also rearranges the order of the passages and omits some passages from consideration. I thank Max Marmor for this reference. Steinitz, *Leonardo da Vinci's Trattato*, 43, gives a list of the full editions of the *Codex Urbinas*; pp. 39 ff. She also provides a list of all printed editions until 1956. Leonardo da Vinci, *Treatise*, ed. McMahon, 1: 362-376, gives an annotated

recent study of the *Codex Urbinas* by Anna Maria Brizio (1956) and the ordering of Leonardo's writings by Carlo Pedretti (1977) now make it possible to relate the *Parte Prima* to Leonardo's surviving notes more fully than any previous study could attempt.

The notes in the *Codex Urbinas* were copied directly from Leonardo's original manuscripts when those manuscripts were still complete and in the possession of Francesco Melzi, Leonardo's pupil and heir to all his writings.⁸ Little is known about Melzi's role in compiling the *Codex Urbinas*, but the attribution is based on physical evidence: a full signature of the *Codex* (folios 87–102) is lacking, and on folio 86 verso, the word "MEL" in the lower right corner strongly suggests that this signature remained in Melzi's hands and was lost.⁹ Attempts have been made to identify Melzi's handwriting. Ludwig identifies Melzi with the hand of the sixteenth-century editor who wrote with a broad ductus, whom he names "Manus 2." Most recently, Carlo Pedretti, following a suggestion made by Gerolamo Calvi, has suggested that Melzi was Ludwig's "Manus 1," the scribe. But internal evidence calls this hypothesis into question: on folio 18 recto, line 2, is a lacuna of about six spaces followed by the note "mancavi vi pero quel ch'io veggio" [you are missing something, as I see], a statement that has been reasonably interpreted by Pedretti and McMahon as a note from the scribe to his supervisor.¹⁰ If Melzi oversaw the project, as all scholars have agreed, would he write such a note?

Unfortunately, nothing concrete is known about Melzi's collaborators, and the identities of the three hands first identified by Ludwig remain unsettled for lack of sufficient documentary evidence. Manus 1 is the scribe; Manus 2 and 3 are sixteenth-century editors, perhaps working contemporaneously with the scribe. Manus 2 made changes in spelling and grammar. Ludwig's Manus 3 suggested revisions in title and changes in the arrangement of the

bibliography of printed editions until 1956. Another recent complete translation is the French edition of Chastel (1961).

⁸ The most complete discussion of the manuscript sources of the *Codex Urbinas* is Pedretti, *Libro A*, 95–174. See also, n. 4.

⁹ Steinitz, *Leonardo da Vinci's Trattato*, 39.

¹⁰ See the full argument by Pedretti, *Libro A*, 260–264, with references, and the citation in the following note here. Dr. Armando Petrucci (in a verbal communication, June 1986), examined facsimile reproductions and expressed doubts that Manus 2 and 3 were the same individual, which is also the opinion of Pedretti, although he was not entirely convinced in 1964 (compare *Libro A*, 263 and 105). It would not be strictly necessary for Melzi to be identified with any hand, for he could have overseen the project without leaving a physical trace. Any documentation pertaining to the shadowy figure of Melzi would be a great contribution to the scholarship.

chapters, and recorded four excerpts as deriving from *Libro A*. Ludwig's "Manus?" responsible for the drawings in the text is Carlo Urbino.¹¹ These collaborators are distinguishable in the original manuscript, although not always in photographic facsimile, on the basis of the color of ink, ductus, and handwriting.

The Manuscript Sources of the Parte Prima

The only writings excerpted in the *Parte Prima* that are still extant are four passages in *Ms. A* datable ca. 1492.¹² According to marginal notes in the *Codex Urbinas*, four more passages were excerpted from the lost *Libro A*, reconstructed by Pedretti on the basis of passages included in the *Codex Urbinas* and dated by him ca. 1508–1510.¹³ The first book on the list of manuscripts used in the compilation of the *Codex Urbinas*, a list included at the end of the manuscript, is called "libro intero segnato i." Pedretti suggests that this lost manuscript might be identified with the lost *Codex Sforza*, a book on painting including comparisons of the arts, written (according to Gian Paolo Lomazzo) by Leonardo at the request of Duke Lodovico.¹⁴

Pedretti has also identified additional drafts and fragments on the comparison of the arts in Leonardo's surviving notes.¹⁵ To this list could be added the draft of a letter written by Leonardo to the overseers of Milan Cathedral, on CA 270 r–c, ca. 1490, in which he compares his duty as architect to that of a physician. There are also

¹¹ Since Panofsky's tentative attribution (1940) of the *Codex Huygens* to Aurelio Luini, more recent attempts have been made to identify relationship between this treatise and the *Codex Urbinas*. See Pedretti, *Commentary*, 1: 63–75, with references to the scholarship, and especially p. 72, where he identifies Girolamo Figino, a Milanese painter, as the author of the *Codex Huygens* and Melzi's assistant, Manus 3. Pedretti and others have also attempted to identify the artist responsible for the illustrations in the *Codex Urbinas*. Most recently Marinelli, "Author of the *Codex Huygens*," has identified the author as Carlo Urbino.

¹² These come from the latter part of *Ms. A*, now bound separately as *Ashburnham II* (2039) (both are in the collection of the Institut de France, Paris); they are excerpted as *Parte Prima* Chapter 23, *Ms. A*, fol. 100r (*Ashburnham II*, 20r); Chapter 19, *Ms. A*, fol. 99r–v (*Ashburnham II*, 19r–v); Chapter 31.1, *Ms. A*, fol. 103r (*Ashburnham II*, 23r); Chapter 38 (except for one section), *Ms. A*, fol. 105r–104v (*Ashburnham II*, fol. 25r–24v).

¹³ Pedretti, *Libro A*. These passages are excerpted as *Parte Prima* Chapter 41 (*Libro A*, Carta 29.48); Chapter 43, last section (*Libro A*, Carta 29.49); Chapter 44 (*Libro A*, Carta 29.50); and Chapter 45 (*Libro A*, Carta 17.18).

¹⁴ *Trattato dell'Arte de la Pittura*, Milan, 1584, 58; see Pedretti, *Libro A*, 9, for discussion.

¹⁵ Pedretti, *Commentary*, 1: 83–85. These are CA 305r–a, ca. 1508; CA 277 v–a, ca. 1513; W. 19101r, ca. 1510–1512; CA 382 v–a, ca. 1515; W. 19071a, ca. 1513; CA 215 v–d, ca. 1490; *Madrid Codex II*, folio 76r, ca. 1503–1505. Pedretti, *Libro A*, 124, lists the same passages, adding McMahon 89, a passage known only from the *Codex Urbinas*, fol. 33v.

a number of passages in other manuscripts that define painting or the senses, or are otherwise related to the content of the *Parte Prima*. These sources are too numerous to list here, but they are discussed in the Commentary Notes. In addition, there are secondary testimonies given by Benvenuto Cellini, Lomazzo, and Ambrogio Mazenta on the existence of comparisons of the arts by Leonardo that are now lost.¹⁶

The Role of the Compilers of the Codex Urbinas

Ludwig Heydenreich called attention to the difference between Leonardo's stated intention to organize his projected treatise on painting according to the "ten functions of the eye" and the eight-section plan of the *Codex Urbinas*, which "reflects relatively little of that schema." Heydenreich noted that Leonardo's discussions of painting recall the formula adopted in earlier treatises on art that Leonardo must have known, by Alberti, Filarete, and Piero della Francesca, and even the medieval formula of Cennini.¹⁷ In fact, Leonardo's plan ultimately derives in part from Aristotle's categories, which he knew primarily through optical treatises, and in part from rhetorical categories adapted by earlier writers on art.¹⁸

By contrast with both of these precedents, the arrangement of the *Parte Prima* suggests a humanist scheme for the hierarchy of the disciplines. Although subdivisions are not formally designated in the original manuscript, the texts of the *Parte Prima* are grouped in five sections according to subject matter: Chapters 1 to 12, definitions of painting as a mathematical science; Chapters 13 to 28, comparisons of painting and poetry; Chapters 29 to 32 (and the misplaced Chapter 46), comparisons of painting and music; Chapters 33 and 34, general discussions of the mechanical arts; and Chapters 35 to 45, comparisons of painting and sculpture. There are exceptions to this grouping—for example, Chapters 7 and 8 are really comparisons of the arts even though they fall in the first

¹⁶ Pedretti's *Commentary* provides convenient access to these sources: Cellini, *Discorso dell'architettura*, excerpt and reference given by Pedretti, *Commentary*, 1: 67; Lomazzo, *Trattato dell'Arte de la Pittura*, 1584, given by Pedretti, 1: 76–81; Mazenta, *Memorie*, ca. 1631, given by Pedretti, 1: 82. (See also Pedretti, *Libro A*, 121–22, where the same references to Lomazzo and Mazenta are cited.)

¹⁷ Heydenreich, Introduction to Leonardo da Vinci, *Treatise*, ed. McMahon, 1: xxiv–xxviii. Heydenreich notes that Filarete certainly knew Cennini's treatise, although he never cites it, and that the other writings must have been available to Leonardo in Milan.

¹⁸ This evidence is discussed fully in the Commentary Notes; see especially CNs 13, 25, 38, and 42.

section with definitions of painting—but generally speaking, the compilers of the *Codex Urbinas* arranged the passages according to a scheme that must be identified with their own intentions, because there is no evidence in Leonardo's writings to suggest that it could have been his. This editorial intention is also attested by the marginal notes of the editors and by evidence that the passages are not arranged by dates of composition, as they seem to be elsewhere in the *Codex*.¹⁹

When the passages excerpted in the *Parte Prima* are compared with their originals and counterparts in Leonardo's own notes, it is most apparent that the organization of the *Trattato* is at odds with Leonardo's intentions. In Leonardo's originals, the definitions of painting and comparisons of the arts are part of a longer discussion of pictorial relief, a scientific discussion that includes precepts for composing paintings derived from the tradition of Alberti's *della Pittura*.²⁰ Following Alberti or one of Alberti's followers, Leonardo defines painting as perspective, under the categories figure, body, and color; another significant precedent for Leonardo was Pecham's *Perspectiva communis*, a source with which he was certainly acquainted by 1492.²¹ As is well known, Alberti himself was indebted to the optical tradition in addition to rhetorical theory. In the context of the original manuscripts, above all in *Ms. A*, where the four extant passages used in the *Parte Prima* are found, a direct relationship is evident between what Leonardo categorized as the "functions of the eye," derived from Aristotle's categories by way of optical treatises, and the rhetorical categories of circumscription, composition or proportion ("commensuratio"), and color. Indeed, other theoretical works of the fifteenth century begin with a scientific definition of terms according to Euclid; of particular note are several late Quattrocento publications presenting theories of rhetorical argumentation which incorporate methods used in Scholastic dialectic by beginning with mathematical definitions of the elements used in propositional arguments. And there are significant correlations between Leonardo's identification of the "functions of the eye" as "visual discourses" and contemporary rhetorical theories, which define "discourse" on the basis of Aristotle's categories in similarly mathematical terms.²²

¹⁹ Brizio, seconded by Pedretti, finds that the general arrangement of the *Codex* is chronological; that is, excerpted from notebooks of various dates arranged chronologically in the order found in those notebooks.

²⁰ See references to additional passages in *appendice*, and CNs 1 and 38.

²¹ See discussion in Chapter Three and CNs 3–6.

²² See CNs 13, 17, 23, 26, and 34.

This fundamental aspect of Leonardo's theory of painting was obscured by the compilers of the *Parte Prima*, who excerpted and then distributed Leonardo's discussion of *rilievo* into topical categories.²³ In place of Leonardo's discussion of imitated *rilievo* as belonging to the science of optics, they substituted what is at heart a humanist polemic for the disciplines associated with letters, an *apologia* for painting as a liberal art associated with poetry. By placing Leonardo's comparisons of painting and poetry directly after his definitions of painting as a mathematical science, the compilers elevated the theme of *ut pictura poesis* to the first rank, using arguments in the tradition of mock epideictic that are, in their original context, purely invectives against poetry.

It is dubious whether Leonardo, who relegated poetry to the lowest position in the hierarchy of the sciences and devised a new elevated place for painting, would have arranged his texts so that poetry follows immediately after the mathematical disciplines. In direct opposition to the humanist tradition, scholastic schemes of the late fifteenth century gave poetry the lowest position in the hierarchy of the sciences.²⁴ If he ever intended a topical arrangement, which is also doubtful, Leonardo might have placed music among the quadrivium of mathematical subjects, and thus ahead of poetry in the traditional hierarchy of the liberal arts. As Heydenreich notes (although he did not draw this conclusion), by including only a brief selection of passages on the subject, the compilers minimized the importance of painting as a mathematical science founded on perspective, an aspect of Leonardo's theory that is pervasive in his writings. At the same time, they aggrandized the importance of poetry by including almost every draft of Leonardo's argument.²⁵

Furthermore, the compilers fabricated out of fragments several new defenses of painting against the other arts, in the case of Chapter 31 pressing into service as a polemic what is merely an expository comparison between the measure of sound and space, as we know from the original, preserved in *Ms. A*. Of the eight

²³ See Appendix 1 on this distribution. As Pedretti, *Commentary*, 1: 151, elaborates, Richter's anthology is based in part on an early scheme of Leonardo's for a projected treatise on light and shade (CA 250 r-a, c. 1940). Parts four through eight of the *Codex Urbinas* reflect a similar plan.

²⁴ Further discussion of these issues can be found in the Commentary Notes; see especially CNs. 1, 10, 17, and 28.

²⁵ A factor responsible for the repetitive nature of the *Parte Prima* arguments. Heydenreich, Introduction to Leonardo da Vinci, *Treatise*, ed. McMahon, 1: xviii, makes the [unconvincing] suggestion that the fragmentary treatment of perspective in the *Parte Prima* is due to the extensive treatment this subject had received in earlier treatises on art. For a different interpretation, see Chapter Four.

passages in the *Parte Prima* for which there is some manuscript evidence, four have been manipulated in some way to create new arguments.²⁶

These facts suggest that if we had more evidence, we would find that the compilers aimed not to clarify Leonardo's views on the classification of the arts and sciences (a topic we know was important in the late fifteenth century), nor to preserve for posterity his witty record of courtly entertainments at the same period, but to contrive a response by Leonardo to the rivalry of painting and sculpture in the mid-sixteenth century. Unfortunately, there is at present no evidence to suggest what the compilers intended to do with the *Codex Urbinas*, or why the *Parte Prima* is missing from all sixteenth-century copies of the *Trattato*, or even who had access to, or contributed to, the project of converting Leonardo's notes into a full-scale treatise on painting. Some of Leonardo's comparisons of the arts also appear in Castiglione's *Il libro del Cortegiano*, first published in 1528, a text which was already conflated in the Renaissance with Leonardo's comparisons of the arts and which was, in all likelihood, the main source for the transmission of his defense of painting to a sixteenth-century audience.²⁷ What is certainly confirmed by internal evidence is that the passages in the *Parte Prima* are colored by a sixteenth-century humanist bias, and the arguments are in part construed by mid-sixteenth-century personalities.

Editorial Procedures

The transcription aims to reproduce the original words of the author as far as it is possible to distinguish his contribution from those of his sixteenth-century compilers. For these reasons, the transcription falls midway between a critical and a diplomatic transcription. Emendations have been made in the *Codex Urbinas* by the two sixteenth-century editors. The text presented here reproduces the version of the scribe because it is closer to Leonardo's own words, coloring the text in a Leonardesque way particularly in matters of orthography and grammar.²⁸ Since four passages are extant in Leonardo's own handwriting, the reading of his original

²⁶ These passages are *Parte Prima* chapters 12, 19, 31, 38, 41, part of 43, 44, and 45; see notes *sub numero* for full discussion.

²⁷ See Chapter One, n. 4.

²⁸ This decision is based on my familiarity with Leonardo's extant manuscripts and on a comparison of passages with their transcriptions in the *Codex Urbinas*. See the Critical Apparatus below which cites significant variations between *Ms. A* and *Parte Prima* chapters 12, 19, 31.1, and 38.

text has been adopted in a few cases, as noted in the apparatus, where the content has been corrupted in the process of transcription to the *Codex*.

Every change from the version of the scribe is recorded in the apparatus and a supplementary apparatus *sub numero* records significant variants in *Ms. A*. Every significant emendation of the sixteenth-century editors is also recorded in the critical apparatus. All transcriptions are based on direct examination of the original documents and, in preparation, the reading has been compared to previously published diplomatic and critical transcriptions. It has not been practical to include all variants from preceding critical transcriptions; however, the apparatus records Ludwig's variant readings of the text (it does not record his omissions).

1. Orthography and Punctuation

Previous transcriptions have not systematically distinguished between the words written by the scribe, which are closest to Leonardo's own characteristic style, and the emendations of the original editors. The result in the past has been a hybrid text, including certain forms that are archaic in modern usage but are also alien to Leonardo's own writing style. Therefore, Leonardo's orthography accentuation and grammatical idiosyncrasies, as recorded by Manus 1, have been preserved in the body of the text presented here, with modern punctuation and capitalization added solely to aid the reader's understanding. These accidentals, namely changes in punctuation and capitalization, are recorded in the apparatus so that the reader can ignore editorial emendations and "return" the text to its original state. No attempt has been made to render the diacritical marks consistently according to modern usage. The stress marks added by the sixteenth-century editor (Manus 3) have not been recorded here to avoid overburdening the apparatus; they are visible in the facsimile published by McMahon.

There are, however, "silent emendations" incorporated to clarify the text, which are given here as follows. The most frequent such emendation is standardization of "e" [and] and "è" [he is]. "Ne" and "nè," "se" and "sè" are also distinguished according to modern practice. Other standard forms adopted are: de'; da' [a contraction of "dai"]; dà [from dare]; d'essa; e'lla; ch'el; se'lla; che'lle; ch'el; ciò; ciòe; dal; con cio sia; nonché; perché; benché.²⁹ According to modern usage, "g" is rendered as "q," and "u" is

²⁹ These forms usually occur in the manuscript as de; da; chel, s'ella, ch'elle; d'al' conciosia; per che, and ben che.

rendered as “v” where appropriate. The sixteenth-century editors made a few grammatical changes, primarily for the sake of correctness and to replace forms such as “lui” with other forms they preferred, such as “egli,” and they eliminated a great many double consonants, typically in forms such as “origgine” or “procederemo” or “sonno.” These changes have not been noted because they would have overburdened the apparatus with little real benefit.³⁰ Changes in orthography and form have been made in a few instances where a scribal corruption was suspected, and these changes are recorded in the apparatus.

A critical transcription should, perhaps to a greater extent than the present one does, accord with modern usage while being sensitive to the period characteristics of a text. Since the Renaissance editors approach modern forms more closely than Leonardo does, it is understandable that previous modern editors have adopted many of their emendations. On the other hand, in its present form the transcription records Leonardo’s literary utterances, which in many respects suggest a close affinity between the spoken and written language of the late fifteenth century. The linguistic aspects of the work would merit a separate study.

Comparison with the original manuscripts reveals how accurately the scribe recorded Leonardo’s orthography and grammar. For example, apart from idiosyncrasies of orthography, Leonardo’s sentences occasionally lack agreement between subject and verb, or noun and pronoun and adjective—as if he wrote in a hurry and never went back over what he had written. In a study devoted to determining the respective roles of Leonardo and the editors of the *Codex Urbinas* it seemed vital to treat these aspects of the manuscript with care. Comparison of the present transcription with Ludwig’s version, which usually follows the original editors’ orthographic and grammatical emendations, reveals the differences between Leonardo’s habits and the preferences of his more highly educated sixteenth-century compilers.³¹

³⁰ The scribe’s emendations can be clearly distinguished from those of the editor in the original, and all changes visible in the facsimile that are not recorded here are due to the editors.

³¹ Another edition based on Ludwig was published, with a preface by Marco Tabarrini and Vasari’s biography of Leonardo with a commentary by Gaetano Milanesi, entitled *Trattato della Pittura di Leonardo da Vinci, Condotta sul Cod. Vaticano Urbinate 1270* (Rome, 1890). Agnolo Borzelli also prepared a critical edition of the *Codex Urbinas*, published in 1914. This edition depends heavily on Ludwig’s reading and is likewise dependable, but Borzelli, who does not indicate that he adopts emendations merely suggested by Ludwig, also rearranges some passages and in a few cases rewrites sections (see, for example, p. 7, N. 9, first sentence and last sentence; in the original manuscript his Nn. 41–44 follow his N. 2; the last

2. Translation

The aim of the translation is to bring out the full sense of the text. It follows the structure of the Italian as closely as is possible, so as to remain compatible with the individual phrases and yet produce idiomatic English. All additions that have nothing corresponding to them in the Italian text are enclosed in square brackets. Significant variant readings by the previous translators, Irma Richter, A.P. McMahon, and Martin Kemp with the assistance of Margaret Walker, are given in the Reader's Notes. Terms that have no corresponding modern English equivalents are given in Italian, with brief explanations in the Reader's Notes and further discussion in the Commentary Notes.³² Like all translations, the present one is provisional and can in no way replace the original Italian, but rather it provides access to Leonardo's thought for the English-speaking reader, and a commentary for those who know Leonardo's native tongue.

3. Figures

There are two figures in the text of the *Parte Prima*, on folio 2 recto, accompanying Chapter 4. These are reproduced somewhat enlarged from McMahon's facsimile, *sub numero*.

4. Reference Matter

The Reader's Notes, which accompany the translation, are keyed by superscript reference numbers. Where a note also pertains to the transcription, the critical apparatus is keyed by an asterisk at the relevant word.

The Commentary Notes, which follow the text and translation, correspond to each passage of the text, designated as Chapters 1–46 following Ludwig. There is one exception, in the case of Chapters 3 through 6, a continuous text to which there is a single

paragraph of N 29 is out of place; and his N. 36 includes three separate passages identified here as Nn. 40, 41, and 42). I. Richter's edition (1939 and 1949), while it is a sensitive study in the humanist tradition of scholarship, is far more liberal in its emendations than a rigorous philological edition like Ludwig's, who, nonetheless, does not indicate where he follows the original editors and where he retains the text of the scribe. McMahon (1956) usually follows Richter's transcription in his English translation, a circumstance that contributes to a number of misinterpretations of the text.

³² There are several studies devoted to the language Leonardo used. See the essential studies cited in the Consolidated Bibliography, by Marinoni (1944 and 1952); Brizio (1952, 689–96, a glossary of grammatical forms and vocabulary; Dionisotti (1962); and Ponte (1976). A useful bibliography appears in Ladendorf, *Kölner medizin historische Beiträge*, 46–53.

corresponding essay. The Commentary Notes are designated as "CN 1-CN 46" to distinguish them from references to the chapters.

Bibliographical references are cited by author and date of publication. Full details will be found in the Consolidated Bibliography. Appendix 1 contains a catalogue of passages in Leonardo's original manuscripts that combine definitions of painting with precepts to painters, derived from Alberti's treatise on painting (designated by the title "trattato sequences," as explained in Chapter Three); and Appendix 2 is a guide to passages in Leonardo's extant notes related to the *Parte Prima* passages. The definitions of painting are also discussed separately, in Chapter Three, so that relationships among texts can be treated in detail.

5. Critical Apparatus

The emendations of the two sixteenth-century editors are not differentiated, but they are distinguishable in McMahon's facsimile. It is not always possible to distinguish in the facsimile the emendations of the scribe from those of Manus 2, but they are distinguished in the apparatus. All abbreviations have been expanded. The following symbols are used in the apparatus:

- OR Manus 1, the scribe
- ED Manus 2 and 3, the original editors
-] end of reference from the transcription
- ; end of individual note concerning the reference
- ^ the absence of a punctuation mark
- ~ in a note concerning only punctuation, corresponds to one word unchanged from the transcription
- * reference appears in the Reader's Notes

TABLE OF CONTENTS OF THE *PARTE PRIMA*

	<i>Text</i>		<i>Notes</i>
	<i>Italian</i>	<i>English</i>	
1. Whether Painting is Science	176	177	297
2. Example, and the Difference between Painting and Poetry	178	179	299
3. On the First Principle of the Science of Painting	180	181	302
4. Principle of the Science of Painting	180	181	302
5. On the Second Principle of Painting	180	181	302
6. The Extent of the Science of Painting	184	185	302
7. The Science Which Is Most Useful and What Constitutes Its Utility	184	185	304
8. On the Sciences Which Can Be Reproduced	186	187	305
9. How Painting Embraces All the Surfaces of Bodies and Extends to Them	190	191	306
10. How Painting Embraces the Surfaces, Figures, and Colors of Natural Bodies, and Philosophy Only Extends to the Natural Powers of Bodies	192	193	309
11. How the Eye is Less Deceived Than Any Other Sense in Its Exercises in the Luminous or Transparent and Uniform, and the Means	192	193	310
12. How Whoever Disparages Painting Loves Neither Philosophy Nor Nature	194	195	314
13. How the Painter Is the Lord of Every Kind of People and All Things	194	195	332
14. About the Poet and the Painter	196	197	334
15. Difference between Poetry and Painting	198	199	336

16. Which Is the Greater Loss to the Human Species, the Loss of an Eye or the Loss of an Ear?	202	203	336
17. How the Science of Astrology is Born of the Eye Because Astrology is Generated by Means of the Eye	206	207	337
18. The Painter Who Disputes with a Poet	206	207	339
19. How Painting, by the Subtle Speculations Which Belong to It, Advances All Human Works	208	209	341
20. The Difference between Painting and Poetry	214	215	344
21. What Differentiates Painting from Poetry	216	217	345
22. The Difference between Poetry and Painting	218	219	346
23. How Painting is Similar to Poetry, and about Their Differentiation	220	221	347
24. On the Eye	226	227	349
25. The Poet and the Painter's Dispute, and What the Difference Is between Poetry and Painting	228	229	352
26. A Poet's Argumentation against a Poet	232	233	355
27. The Response of King Matthias to a Poet Who Entered into Competition against a Painter	234	235	356
28. Conclusion[s] Derived from the Poet and the Painter	238	239	358
29. How Music Ought to Be Called the Sister and the Lesser of Painting	240	241	366
30. A Musician Speaks with a Painter	242	243	368
31. The Painter Presents Things Which Are Placed Opposite the Eye, According to Degrees, as Does the Musician with Voices Placed Opposite the Ear	242	243	369
32. Conclusion[s] Derived from the Poet, Painter, and Musician	246	247	371
33. Which Science Is Mechanical, and Which Is Not Mechanical	250	251	379
34. Why Painting Is Not Numbered			

among the Sciences	254	255	380
35. Beginning of Sculpture, and Whether It Is Science	256	257	392
36. The Difference between Painting and Sculpture	256	257	392
37. A Painter and a Sculptor	260	261	395
38. How the <i>Ingegno</i> of Sculpture Is Less Than That of Painting and Is Missing Many Parts of Nature	264	265	396
[Continuation of Chapter 38]	282	283	396
39. On the Sculptor and the Painter	268	269	399
40. Comparison of Painting to Sculpture	272	273	403
41. Sculpture Put upon a Par with Painting	274	275	406
42. Comparison between Painting and Sculpture	274	275	407
43. Cross-examination of the Sculptor	278	279	409
44. On the Indebtedness of Sculpture to Light, But Not of Painting	280	281	410
45. The Difference between Painting and Sculpture	280	281	411
46. On Painting and Poetry	284	285	413

THE *PARTE PRIMA*

TEXT

Parte prima
Libro di Pittura di M.
Lionardo da Vinci Pittore
et scultore fiorentino

1

Se la pittura è scientia, o no

5

Scientia è detto quel discorso mentale il qual ha
origine da' suoi ultimi principij. De' quali, in natura,
nul'altra cosa si può trovare che sia parte d'essa scientia
come nella quantità continua, cioè la scientia de
geometria, la quale cominciando dalla superfitie de' corpi,
si trova havere origine nella linea, termine d'essa
superfitie; e in questo non restiamo soddisfatti perché noi
conosciammo la linea havere termine nel ponto e il puonto
essere quello del quale nul'altra cosa può essere minore.
Adonque il ponto è il primo principio della Geometria, e
nessun' altra cosa può essere, nè in natura nè in mente
humana, che possa dare principio al puonto. Perché se tu
dirai nel contatto fatto nessuna superfitie da una ultima
accuità della punta delo stile, quello essere creatione del
puonto, questo non è vero; ma diremo questo tale contatto
essere una superfitie che circonda il suo mezzo, et in esso

10

15

20

1 1 Parte] OR from "Parte" through "Pittore" at the end of line 3, the text is rendered in Roman capital letters: "PARTE.PRIMA./LIBRO DI PITTURA DI.M./LIONARDO.DA VINCI.PITTORE."

2 .M.] .I. OR interlined at end of line

5 o no] ED adds "o no"; scientia ^] ~ , ED followed by "Sarebbe meglio dire a questo Cap[it]t[ol]o: Che cosa sia scientia"

7 principij. De'] principij, de' OR

12 e] et ED

14 minore. Adonque] minore ^ a dongue OR

15 Geometria, e nessun' altra] Geometria: et niun'altra ED ":" and "t" added and "nessun'" altered to "niunn'"

17 puonto. Perché] ~ ^ perche OR

18 nessuna] sopra una ED interlined above deleted "nessuna"

20 è vero;] ~ ~ ^ OR

PART ONE

THE BOOK ON PAINTING BY LEONARDO DA VINCI, FLORENTINE PAINTER AND SCULPTOR

1. Whether Painting is Science, or Not

That mental discourse which originates from first¹ principles is called science. Nothing that is a part of science can be discovered in nature beyond its first principles, as in continuous quantities, that is, the science of geometry which, beginning with the surfaces of bodies, is found to have its origin in lines, the boundary² of a surface; and we are not satisfied with this [explanation] because we know that the line has its limit in a point, and a point is that of which nothing can be less. Therefore, the point is the first principle of geometry, and no other thing can exist either in nature or in the human mind from which the point can originate.³ If you were to say that the creation of a point is the final contact made with the point of a stylus on a surface, this is not true; we would say such contact is a surface that surrounds a center, and in that center is the

¹ "Ultimi" could be translated "final," but it is clear from the context that "ultimi principij" refer to the first principles of mathematics. It is more difficult to explain why Leonardo used the term "ultimi," but he might have derived it from a text such as Mondino's *Anatomia*: the Proem gives the principles of medicine of which the "ultima cagione" is to 'speculare . . . il qual fine massimamente mediante i sensi corporei si consegue . . . come chiaramente manifesta Aristotile nel proemio della *Metaphisica*' (ed. Sighinolfi, p. 25). See Commentary, CNs 1 and 2; compare Chapter 6.

² "Termine" is translated "boundary" here and "limit" in the next clause because English, unlike Italian, distinguishes between three- and two-dimensional "termination."

³ Probably an Aristotelian distinction between physical and mathematical entities, the latter of which the human mind can consider apart from matter. Leonardo's definition of the first principles of geometry follows Euclid. See Commentary.

mezzo è la ressidencia del puonto. E tal puonto non è
 della materia d'essa superfitie: nè lui nè tutti li
 puonti de l'universo, sonno in pottentia, anchor che sienno
 uniti, dato che si pottessero unire, comporrebbero parte 25
 alcuna d'una superfitie. E dato che tu te immaginassi un
 tutto essere composto de mille puonti, qui dividendo alcuna
 parte da essa quantità de mille, si può dire molto bene
 che tal parte sia eguale al suo tutto. E questo si prova
 col zero, over nulla, cioè la deccima figura de la 30
 arismeticha, per la quale si figura un "O" per esso nullo.
 Il quale posto dopo la unita, il fa dire dieci, e se ne
 porrai due dopo tale unita, dira' cento, e così
 infinitamente crescerà sempre dieci volte il numero dove
 esso s'aggiongìe. E lui in sè non vale altro che nulla, e 35
 tutti li nulli dell'universo sonno eguali a un sol nulla in
 quanto alla loro sustantia e valitudine.

Nissuna humana investigatione si pò dimandare vera
 scientia se essa non passa per le Matematiche dimostrationi.
 E se tu dirai che le scientie che principiano e finischano 40
 nella mente habbiano verita, questo non si concede, ma si
 niega per molte raggioni. E prima che in tali discorsi
 mentali non accade esperientia, senza la quale nulla dà di
 sè certezza.

2

Essempio et differenza tra Pittura et Poesia

Tal proportionione è dalla imaginatione a l'effetto
 qual'è da l'ombra al corpo ombroso. E la medesima
 proportionione è dalla poesia alla pittura, perché la poesia
 pon le sue cose nella imaginatione de lettere e la pittura 5
 le dà realmente fori de l'occhio, dal qual occhio riceve
 le similitudini non altrimenti che s'elle fussino naturali,

22 puonto. E tal puonto] ~ ^ è tal puonto OR

26 superfitie. E] ~, è OR

29 tutto. E] ~ ^ e OR

30 de la] OR followed by "1270. Urb." in lower right margin

31 "O"] .o. OR; nullo. Il] ~ ^ il OR

35 s'aggiongìe, E] ~ ^ è OR

37 valitudine] ED followed by ".valore. et non valitudine?"

39 scientia] scienti OR; dimostrationi. E] ~ ^ e OR

42 raggioni. E] ~ ^ e OR

2 1 differenza] diffenza OR

3 ombroso. E] ~ ^ e OR

location of the point. This point is not part of the matter of the surface: neither this point nor all the points which potentially exist in the universe, even if they were united, given that they could be united, would compose any part of a surface. As you would imagine a whole composed of a thousand points, dividing some part of that quantity by a thousand, we could very well say that this part is equal to the whole. This is proved by zero, or true nothing, which is the tenth figure in arithmetic, figured as an "o" for its nothingness. If this [figure] is placed after the unit, it is called ten, and if two are placed after this unit, it is called hundred, and so on infinitely, it will increase the number ten times wherever it is added. In itself it is worth nothing more than nothing, and all the nothings in the universe are equal to a single nothing in both their substance and value.

No human investigation may claim to be a true science if it does not pass through mathematical demonstrations; and if you would say that those sciences which begin and end in the mind possess truth, this is not conceded, but denied for many reasons. The foremost [reason] is that such mental discourses do not involve experience, and nothing renders certainty of itself without experience.

2. An Example, and the Difference between Painting and Poetry

There is such a proportion between the imagination and the effect as there is between the shadow and the umbrageous body.⁴ And the same proportion exists between poetry and painting because poetry uses letters to put things into the imagination, and painting renders things really outside the eye so that the eye receives the similitudes⁵ as if they were natural; and poetry renders what is natural without

⁴ "Corpo ombroso" is a technical term derived from optics. The translation follows Lindberg, ed. and trans., John Pecham, *Perspective communis*. See further discussion in the Commentary.

⁵ "Similitudine," translatable as "image," is used in optical writings. Richter incorrectly translates "reflections." On these and the following terms, see discussion in the Commentary.

e poesia le dà senza essa similitudine, e non passano alla impressiva per la via della virtù vissiva come la pittura.

3

Del primo principio della scientia della pittura

Il principio della scientia della pittura è il puonto, il secondo è la linea, il terzo è la superfitie, il quarto è il corpo che si veste de tal superfitie. E questo è in quanto a quello che si fingie, cioè esso corpo che si fingie; perché in vero la pittura non s'astende più oltra che la superfitie, per la quale si fingie il corpo, figura di qualunque cosa evidente.

5

4

Principio della scientia della pittura

La superfitie piana ha tutto il suo simulacro in tutta l'altra superfitie piana che li sta per obbietto. Provassi, e sia r.s. la prima superfitie piana e o.q. sia la seconda superfitie piana posta a riscontro alla prima. Dico, ch'essa prima superfitie r.s. è tutta in o.q. superfitia, e tutta in o., e tutta in q., e tutta in p. Perché r.s. è bassa de l'angholo o. e de l'angholo p., e così d' infiniti angholi fatti in o.q.

5

5

Del secondo principio della pittura

Il secondo principio della pittura è l'ombra del corpo, che per lei si fingie de questa ombra. Daremo li suoi principij e con quelli procederemo nell'insculpire la predetta superfitie.

5

- 3 4 superfitie. E] ~ ^ e' OR
 5 fingie] ED followed by: "questo cap. [itol]o . . . Del p[rim]o principio della scientia della pittura ed li tre altri che lo sene havevano più conveniente loco nella seconda Parte di questo libro dietro il Cap[i]t[ol]o come Fu la prima Pittura qual è a carte 49 F 2,"
- 4 3 obbietto. Provassi] ~ ^ provassi OR; la] la la OR
 5 prima. Dico] ~ ^ dico OR
 9 With two diagrams in the text
- 5 3 ombra. Daremo] ~ ^ daremo OR
 4 nell'insculpire] nell'isculpire ED "n" deleted in "insculpire"

that similitude, and [things] do not pass to the *impressiva*⁶ by way of the visual virtue⁷ as [it happens in] painting.

3. On the First Principle⁸ of the Science of Painting

The [first] principle of the science of painting is the point, the second is the line, the third is the surface, [and] the fourth is the body which is clothed by these surfaces. And what is feigned goes this far, that is, to the body that is feigned;⁹ because, truly, painting does not extend beyond the surface by which the body, the figure of any perceptible thing, is feigned.

4. Principle of the Science of Painting

The plane surface has all of its simulacrum¹⁰ at all [points] of another plane surface which is its object. Proof: let *rs* be the first plane surface and *oq* be the second plane surface facing the first. I say that all of the first surface *rs* is in the surface *oq*, and everything [is] at *o*, and everything [is] at *q*, and everything [is] at *p*. Because *rs* is the base of the angle at *o* and of the angle at *p*, and so on, of infinite angles made on *oq*. [with two diagrams]

5. On the Second Principle of Painting

The second principle of painting is the shadow of the bodies:¹¹ we feign the bodies by means of this shadow. We shall give its principles and with those principles we will proceed to sculpt¹² the designated surface.

⁶ A term, probably coined by Leonardo, that Richter incorrectly translates "consciousness."

⁷ A term used in medieval psychology of the senses. The translation follows D. Strong. Richter translates "organ of sight."

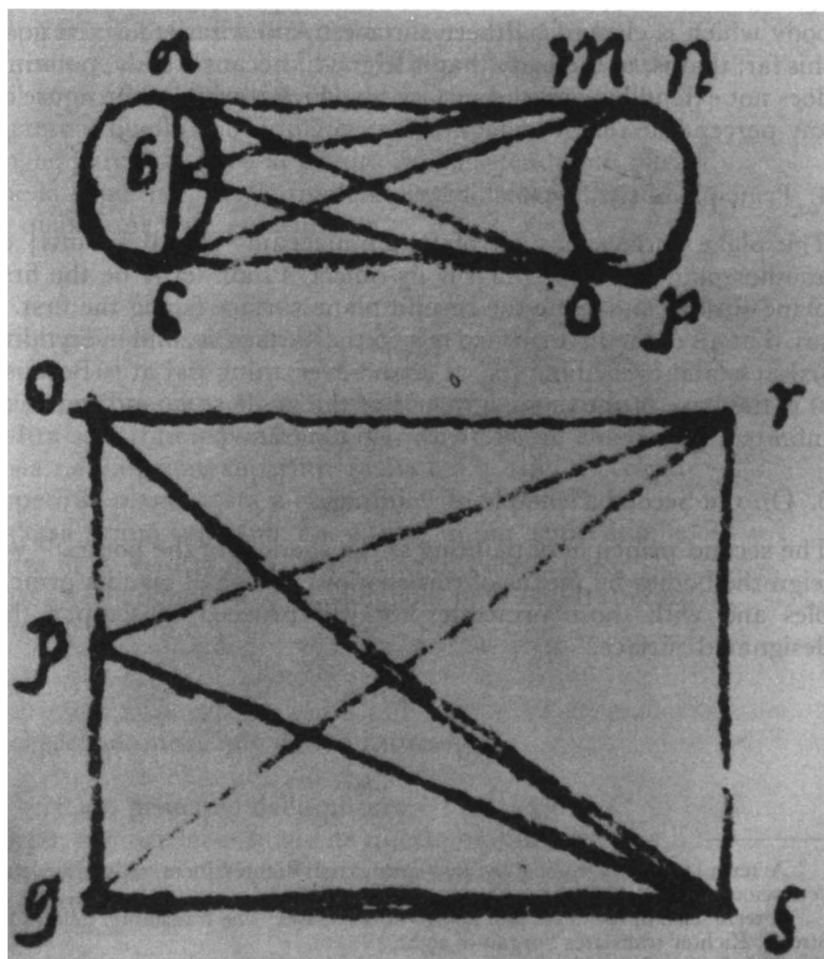
⁸ Richter translates "beginning," but "principio" refers to "principle," as it does in Chapter 1.

⁹ "Fingere" might also be translated as "to make," but "to feign," a verb commonly used in the sixteenth century, is more accurate: compare "figurare," discussed in n. 31.

¹⁰ In the present context, this is another term used in optics meaning "likeness" or "image." See Commentary.

¹¹ Richter translates "shading of bodies," which is generally correct.

¹² Carving, engraving, or incising, but Richter translates "modelling." Kemp/Walker translates "model in three dimensions."



Ill. 19. Text figure. *Codex Vaticanus Urbinas 1270*, folio 2 recto. Detail.
The Vatican Library.

4. Principle of the Science of Painting

The plane surface has all of its simulacrum at all [points] of another plane surface which is its object. Proof: let rs be the first plane surface and oq be the second plane surface facing the first. I say that all of the first surface rs is in the surface oq , and everything [is] at o , and everything [is] at q , and everything [is] at p . Because rs is the base of the angle at o and of the angle at p , and so on, of infinite angles made on oq . [with two diagrams]

6

In che s'astende la scientia della pittura

La scientia della pittura s'astende in tutti li colori delle superfitie, e figure da corpi da quelle vestiti, et a loro propinquità e remotioni con li debbiti gradi de diminutione secondo li gradi delle distantie. E questa scientia è madre della prospettiva, cioè linee visuali. 5
La qual prospettiva si divide in tre parti, e di queste la prima contiene solamente li lineamenti de' corpi; la seconda della diminutione de' colori nelle diverse distantie; la terza della perdita della congiunzione de' corpi in varie distantie. Ma la prima, che sol s'astende nelli lineamenti e termini de corpi, è detto disegno, cioè figurazione de qualonque corpo. Da questa n'esse un'altra scientia che s'astende in ombra e lumme, o voi dire chiaro e scuro. La qual scientia è di gran discorso; ma quella delle linee visuali ha partorito la scientia dell'astronomia, la quale 10
è semplice prospettiva perché son tutte linee visuali e piramidi tagliate. 15

7

Quale scientia è più utile et in che consiste la sua utilità

Quella scientia è più utile della quale il suo frutto è più comunicabile, e così, per contrario, è meno utile ch'è meno comunicabile. La pittura ha il suo fine comunicabile a tutte le generationi de l'universo perché il suo fine è subbietto della virtù visiva, e non 5

-
- 6 5 distantie. E] ~ ^ è OR
6 visuali. La] ~ ^ la OR
10 congiunzione] Ludwig suggests amending to "cognitione"
11 distantie. Ma] ~ ^ ma OR
13 corpo. Da] ~ ^ da OR
14 scuro. La] ~ ^ la OR
17 semplice] sempliice OR; visuali] OR preceded by deleted "tagliate"
7 1 scientia] scienta OR
5 comunicabile. La] ~ ^ la OR

6. The Extent of the Science of Painting

The science of painting extends to all the colors of surfaces, and to the figures¹³ of bodies clothed¹⁴ by those surfaces, and to the propinquity and remoteness of the bodies with their proper degrees of diminution according to the degrees of distance. This science is the mother of perspective, that is, visual lines. Perspective is divided into three parts, of which the first is concerned solely with the main lines¹⁵ of bodies; the second with the diminution of colors at various distances; the third with the loss of the cognition¹⁶ of bodies at various distances. Now the first [part], which only extends to the main lines and boundaries of bodies, is called drawing,¹⁷ that is, the figuration of any body. Another science issues out of it which extends to shadow and light, or if you wish, chiaroscuro. This science is of great discourse;¹⁸ but the science of visual lines gave birth to the science of astronomy, which is a simple¹⁹ perspective because all [its elements] are visual lines and intersected pyramids.

7. The Science Which Is Most Useful and What Constitutes its Utility

The more useful science is the one whose product is more communicable, and the same applies to the contrary: what is less communicable is less useful. The end result²⁰ of painting is communicable to all generations in the universe because its final effect

¹³ Or “shapes.” “Figura” suggests Leonardo’s derivation from the terminology of geometry.

¹⁴ Richter translates “enclosed.”

¹⁵ Leonardo’s vocabulary for various kinds of lines is rich; “lineamenti” might be translated “outlines,” as Kemp/Walker does, but it is not synonymous with “contours.” Richter translates “line-drawing,” but Leonardo does not refer directly to graphic lines until the next sentence, and “lineamenti” has a less specific connotation.

¹⁶ “Congiunzione” is a scribal error. Ludwig suggests “cognitione.” “Congiunzione” is a simpler restoration, but its meaning is more difficult to justify. Richter and McMahon translate “loss of distinctness.” Kemp/Walker translates “definition.” Compare *Ms. A*, f. 98r, lines 7–8: “le cose devono essere men finite, quanto piu s’alontanano” (Leonardo names this “prospettiva di spedizione”). See Commentary.

¹⁷ McMahon translates “design.”

¹⁸ Past translators have rendered “discorso” into English by various circumlocutions. Here Richter translates “requires much exploration” and McMahon translates “capable of great development.” Neither translation is adequate: see Commentary.

¹⁹ Richter translates “simply” (as an adverb); Kemp/Walker translates “merely”; but Leonardo means “linear perspective” by an alternate term.

²⁰ Aim, end, or purpose.

passa per l'orechio al senso comune col medesimo modo che
 vi passa per il vedere. Andonque, questa non ha bissoigno de
 interpreti de diverse lingue come hanno le lettere, e subito 10
 ha satisfatto alla humana spetie, non altrimenti che si
 facciano le cose prodotte dalla natura; è nonché alla
 spetie humana, ma alli altri animali, come s'è manifestato
 in un pittura immitata da uno padre de famiglia, alla quale
 faceva carezze li piccioli figlioli che anchora erano nelle 15
 faccie, e similmente il cane e gatta della medesima casa.
 Ch'era cosa maravigliosa a considerare tale spettacolo!

La pittura rapresenta al senso con più verità e
 certezza l'opere de natura che non fanno le parolle o le 20
 lettere, ma le lettere rapresentano con più verità le
 parole al senso che non fa la pittura. Ma diremmo essere
 più mirabile quella scientia che rapresenta l'opere de
 natura che quella che rapresenta l'opere de l'operatore,
 cioè l'opere de gli homini che sono le parole, com'è la
 poesia e similli che passano per la humana lingua. 25

8

Delle scientie inimitabili

Le scientie che sonno inimitabili in tal modo che con
 quelle il discepollo si fa eguale allo haultore e similmente
 fa il suo frutto, queste sonno uttile allo immitatore, ma
 non sonno de tanta eccellentia quanto sonno quelle che non 5
 si possono lasciare per heredita come l'altre sustantie,
 infra le quali la pittura è la prima. Questa non s'insegna
 a chi natura nol concede, come fan le matematiche delle
 quali tanto ne piglia il discepollo quanto il maestro gli ne
 leggie; questa non si coppia, come si fa le lettere, che 10
 tanto vale la coppia quanto l'origgine; questa non

9 vedere. Adonque] ~ ^ adonque OR

16 casa. Ch'era] ~ ^ ch'era OR

17 tale] ED interlined "si fatto" above "tale"; spettacolo!] ~ ^ OR

19 certezza] OR second "z" altered from "a"

21 pittura. Ma] ~ ^ ma OR

8 1 inimitabili] imittabili* ED "in" deleted and followed by "e come la Pittura è inimitabile però è scientia"

2 inimitabili] imitabili ED "in" and first "t" deleted

6 come] come OR "o" altered from "h"

7 prima. Questa] ~ ^ questa OR

10 leggie; questa] ~ , questa OR

11 l'origgine; questa] ~ , questa OR

is dependent upon the *virtù visiva*.²¹ It does not pass through the ear to the *senso comune*,²² it passes in the same way as sight. So [painting] needs no interpreters of different languages as letters do. [Painting] satisfies the human species immediately, not differently than things produced by nature do, and it satisfies not only the human species but also other animals, as was shown by a painting which portrayed the father of a family, which little children tried to caress when they were still in swaddling clothes, and also the dog and cat of the same household. What a marvelous thing it was to observe this scene!

Painting represents the works of nature to the [common] sense with more truth and certitude than words or letters do, but letters present words to the [common] sense with more truth than painting does. We will declare that the more admirable science is the one that represents the works of nature rather than the works of the worker, that is, the works of man, which are his words such as poetry and similar things which pass [to the common sense] through human language.

8. On the Sciences Which Can Be Reproduced²³

The sciences which can be imitated in such a way that the student may become equal to the master,²⁴ and make his product in the same way, are useful to the imitator, but they are not as excellent as those which cannot be inherited like other substances.²⁵ Among [the latter] painting is the foremost. It cannot be taught to someone whom nature does not endow, as happens with mathematics where the student takes in as much as the master reads him about it. It cannot be copied, as happens with letters, where the copy is worth as much as the original. It cannot be cast, as happens with

²¹ See n. 7.

²² A term used in medieval faculty psychology, designating one of the inner senses. Kemp/Walker translate as “sensus communis.” Leonardo uses the Italian “senso comune.” See Commentary to Chapter 2.

²³ McMahon, Richter, and Kemp/Walker translate as “imitable.”

²⁴ Literally, “author” or “authority.”

²⁵ Richter translates “goods” which can be left for heredity, and McMahon similarly translates “these are useful to the imitator but are not as excellent as are those which cannot be left as an inheritance, as can other things [*sustantie*].” However, the Aristotelian Scholastic sense of “substances” meaning “essences which can be perceived” seems more likely. The grammar is ambivalent. See Commentary.

s'inpronta, come si fa scultura della quale tal'è la
 impressa qual'è la origine in quanto alla virtude
 l'opera. Questo no' fa infiniti figlioli, come fa li libri
 stampati. Questa sola si resta nobile, questa sola onora 15
 il suo Autore e resta pretiosa e unica e non partorisce mai
 figlioli eguali a sè. E tal singularita la fa più
 eccellente che quelle che per tutto sonno publicate. Hor
 non vedemo noi li grandissimi Re dell' Oriente andare velati
 e coperti, credendo diminuire la famma loro col publicar e 20
 divulgare le loro pressentie? Hor non si vede le pitture
 rapresentatrici delle divine deita essere al continuo
 tenute coperte con coperture di grandissimi prezzi, e quando
 si scoprano prima si fa grande solennita eclesiastiche, de 25
 vari canti con diversi suoni. E nello scoprire, la gran
 moltitudine de populi che qui vi concorrono immediate si
 gittanno a terra quella adorando e pregando per cui tale
 pittura, è figurata, de l'aquisto della perduta sanita e
 della eterna salute, non altra mente che se tale Iddea
 fusse li presente in vitta. Questo non accade in 30
 nissun'altra scientia od altra humana opera, et se tu dirai
 questa non esser virtù del pittore, ma propria virtù della
 cose immitata, si rispondera, che in questo caso la mente
 delli homini pò satisfare standossi nel letto, e non
 andare nè lochi faticosi e pericolosi nè pellegrinaggi, 35
 come al continuo far si vede. Ma se pure tai pellegrinaggi
 al continuo sono in essere, chi li move senza nessesità?
 Certo tu confessarai essere tale simulacro, il quale far non
 pò tutte le scritture che figurar pottessino in effigia, e
 in virtù tale Iddea. Adonque pare che essa Iddea ami tal 40
 pittura et ami chi l'ama e riverisse, et si diletta d'essere

14 l'opera. Questo] ~ ^ questo OR

15 stampati. Questo] ~ ^ questo OR

17 se. E] ~ , è OR

18 publicate. Hor] ~ , hore OR

21 divulgare] diulgare OR; divulgare ED "v" interlined above "u"; pressentie?

Hor] ~ ^ hor OR

22 rapresentatrici] rapresentatrichti OR second "a" altered from "r"

25 suoni. E] suoni, e OR

26 populi] pouli OR; populi ED second "p" interlined above "u"

30 vitta. Questo] ~ ^ questo OR

34 standossi] standosi ED first "s" deleted; faticosi] faticosi Ed first "t" deleted

36 vede. Ma] ~ ^ ma OR

37 nessesità? Certo] ~ ^ certo OR

40 Iddea. Adonque] iddea: adonque OR; Iddea] iddea OR

sculpture where the impression is like the original as far as the virtue²⁶ of the work is concerned. It does not produce infinite children, as do printed books. Painting alone remains noble, it alone honors its author and remains precious and unique and never bears children equal to itself. This singularity makes painting more excellent than those [sciences] which are made public everywhere. Do we not even now see the greatest kings of the Orient go veiled and covered, believing that they might diminish their fame by showing themselves in public and divulging their presences? Do we not see that paintings which represent divine deities are continuously kept covered with the most expensive coverings, and that when they are uncovered first great ecclesiastical solemnities are held, with various songs²⁷ accompanied by different instruments? At the moment of unveiling, the great multitude of people who have assembled there immediately throw themselves to the ground, worshipping the painting and praying to the one who is figured in it, in order to acquire the health that they have lost and for their eternal salvation, as if in their minds such a god were alive and present. This does not happen with any other science or other works of man, and if you would claim that this is not due to the virtue of the painter, but to the inherent virtue²⁸ of the thing imitated, it may be implied that if that were the case, the minds of men could be satisfied by staying in bed, rather than going either to tiring and dangerous places or on pilgrimages as one continually sees being done. Now if these pilgrimages continue to take place, who moves [people] without necessity? Certainly you will confess that it is this simulacrum,²⁹ which does what all the writings cannot do—to potentially³⁰ figure³¹ the virtue of such a Deity in an effigy. So it seems that the Deity loves such a painting and loves whoever loves and reveres it, and takes more delight in being adored by that

²⁶ Meaning worth or merit. For Renaissance meanings of “virtù,” see Commentary. Kemp/Walker translates “where the impression is worth as much as the original.”

²⁷ McMahon translates “chants.” Kemp/Walker translates “hymn singing.”

²⁸ Intrinsic merit.

²⁹ In this case, “simulacrum” is a devotional image, a likeness or imitation of God. Compare “simulacrum” designating an optical term: see n. 10.

³⁰ “Potessino” is a textual corruption. “Potesseno” is the third person plural, “potessimo” is the first person plural.

³¹ This literal translation conveys the association between word and image in a way that a modern substitution such as “to represent” cannot vie with its Elizabethan equivalent.

adorata più in quella che in altra figura di Lei immitata e per quella faccia gratie e doni di salute, secondo il credere di quelli che in tal loco concoreno.

9

Come la pittura abbraccia tutte le superfitie de corpi, e in quelle s'astende

La pittura sol s'astende nelle superfitie de corpi, e'lla sua prospettiva s'astende nel'accressimento et decressimento de' corpi e de lor colori, perché la cosa che si remove dall'occhio perde tanto di grandezza e de colore quanto l'aquista de remottione. Adonque, la pittura è filosofia perché la filosofia tratta de moto aumentativo e diminutivo, il quale si trova nella sopra detta propositione. Della quale faremo la conversa, e diremo: la cosa veduta da l'occhio aquista tanto de grandezza e notitia e colore quanto ella diminuisse lo spatio interposto infra essa e l'occhio che la vede. 5

Chi biasima la pittura biasima la natura, perché l'opere del pittore rapresentano l'opere d'essa natura, e per questo il detto biassimatore ha carestia de sentimento. 10

Si prova la pittura essere filosofia perché essa tratta del moto de' corpi nella prontitudine delle loro attioni, e la filosofia anchora lei s'astende nel moto. 15

Tutte le scientie che finiscono in parolle ha sì presto morte come vitta, eccetto la sua parte manuale, cioè lo scrivere, ch'è parte mechanica. 20

9 1 abbraccia] abrascia OR

2 s'astende] s'estende ED "a" altered to "e" and followed by "et come ell è filosofia"

7 remottione. Adonque] ~ ^ adonque OR

10 propositione. Della] ~ ^ della OR; diremo:] dire^ OR; diremo^ ED "mo" interlined above "la"

11 aquista] OR first "a" altered from "g"

12 quanto] OR preceded by deleted "quanto"

13 vede] ED followed by "vorebbe seguita il. 2. terzetto che segue che dice. Si prova la Pittura"

20 ha] hanno ED "no" interlined after "ha"

[simulacrum] than by any other figure of imitation; and thus bestows grace and gifts of salvation in accordance with the faith of those who assemble in that place.

9. How Painting Embraces³² All the Surfaces of Bodies and Extends to Them

Painting only extends to the surfaces of bodies, and its perspective extends to the increase and decrease [in size] of bodies and of their colors, because as a thing recedes from the eye it loses size and color to the extent that it acquires distance. Therefore, painting is philosophy because philosophy treats augmented and diminished motion, which is found in the above proposition. Conversely, we may say that the object seen by the eye acquires such size and clarity³³ and color as the space interposed between it and the eye that sees it diminishes.

Whoever blames painting blames nature, because the works of the painter represent the works of nature. For this [reason] the said blamer is lacking all feeling.

The proof that painting is philosophy is that it treats the motion of bodies in the liveliness³⁴ of their actions, and philosophy also extends to motion.

All the sciences which end in words are dead as soon as they are born except for the manual part, that is, writing, which is the mechanical part.

³² Includes.

³³ "Notitia" means "knowledge" in the sense of "information." Richter translates "importance"; McMahon does not translate the word.

³⁴ More literally, promptitude.

10

Come la pittura abbraccia le superfitie, figure e colori de'
corpi naturali, e la filosofia sol s'astende nelle lor
virtù naturali

La pittura s'astende nelle superfitie, colori e figure
de qualunque cosa creata dalla natura, e la filosofia 5
penetra dentro alli medessimi corpi, considerando in quelli
le lor proprie virtu, ma non rimane soddisfatta con quella
verità che fa il pittore, che abbraccia in sè la prima
verità di tali corpi, perché l'occhio meno se inganna.

11

Come l'occhio meno s'engana nelli suoi esserciti che nisun
altro senso in luminosi o trasparenti et uniformi et mezzi

L'occhio nelle debite distantie e debiti mezzi meno
s'ingana nel suo uffitio che nisun altro senso perché vede 5
se no' per linee rette che compongono la piramide che li fa
bassa dell'obbietto e la conduce a esso occhio, come intendo
provare. Ma l'orecchio forte s'ingana nelli siti e
distantie delli suoi obbietti perché non vengono le spetie
a lui per rette linee, come quelli dell'occhio, ma per linee 10
tortuose e riflesse. E molte sonno le volte che le remote
paionno più vicine che le propinque, mediante li transiti
di tali spetie; benché la vocce di eccho sol per linee
rette si riferisse a esso senso. L'odorato meno certifica
del sito d'onde si causa un'odore, ma il gusto et il tatto, 15
che tocchanno l'obbietto, han solo nottitia d'esso tatto.

10 1 le] le ED followed in right margin in five lines: "questo cap[itol]o e sia unito a quello di sopra è fatto tutt'uno"

11 1 esserciti] essertiti OR

2 in luminosi] Illuminosi ED "in" deleted, "Il" added before "l"; trasparenti] tranparenti OR; trasparenti ED "n" altered to "s"; mezzi]*

7 provare. Ma] ~ ^ ma OR

8 vengono] vengano OR

10 riflesse. E] ~ ^ e OR

13 senso. L'odorato] ~ ^ l'odorato OR; meno] OR followed by deleted "s'ingana"

10. How Painting Embraces the Surfaces, Figures, and Colors of Natural Bodies, and Philosophy Extends Only to the Natural Powers³⁵ of Bodies

Painting extends to the surfaces, colors, and figures³⁶ of any thing created by nature, and philosophy penetrates inside these same bodies to consider their individual powers,³⁷ but it does not remain satisfied with the truth the painter renders, which in itself embraces the prime truth of these bodies, in that the eye deceives itself less.

11. How the Eye is Less Deceived in Its Workings in the Luminous or Transparent and Uniform Media³⁸ Than Any Other Sense

At the proper distances and in its proper media,³⁹ the eye is less deceived in its function than any other sense. As I intend to prove, this is because the eye sees only by straight lines which compose a pyramid that has its base on the object, and leads to the eye. Now the ear is strongly deceived with respect to the locations and distances of its objects because its species⁴⁰ do not come to it by straight lines as do those of the eye, but by tortuous and reflected lines. Many times what is remote sounds closer than what is nearby. This occurs in the transit of these species, even though sound in an echo is reported back to the sense [of hearing] only by straight lines. [The sense of] smell is certified⁴¹ even less with respect to the source of an odor, while taste and touch, which both touch the object, gain knowledge only through this contact.

³⁵ Richter and McMahon translate “properties,” but in this context, “virtù” is similar to “forza” in mechanical theory, the equivalent of the Late Scholastic term “impetus” (see E. Moody in Pedretti, *Commentary* to R. 1138, with references). Compare “virtus impressa,” translated “impetus” or “momentum.”

³⁶ Shapes. See n. 13.

³⁷ Kemp/Walker translates “distinctive essences.” See n. 35.

³⁸ “Mezzi” can be translated “media” or “atmosphere,” “means” or “mode,” or “mean” or “middle,” but whichever reading is correct, the text is corrupt. This translation follows McMahon, who suggests that “et” before “mezzi” is an error. Richter translates “ends and means,” but if “mezzi” means “the means,” referring to the whole statement, it should read “et li mezzi.”

³⁹ See preceding note. Richter translates “required atmospheric conditions;” McMahon translates “with the proper media.”

⁴⁰ A term used in optics, roughly meaning “image.” See Commentary.

⁴¹ “Certification” of the senses has mathematical connotations derived from Alhazen’s geometric theory of the action of light. Leonardo’s discussion of “species” can be associated especially with Roger Bacon. See Commentary. McMahon’s translation is generally correct: “the sense of smell is less certain still as to where the cause of an odor may be located.”

12

Come chi sprezza la pittura non ama la filosofia, nè la natura

Se tu sprezzarai la pittura, la quale è sola
 imitatrice de tutte l'opere evidenti de natura, per certo tu
 sprezzarai una sottile inventione, la quale con filosoficha e 5
 sottile speculatione considera tutte le qualità delle forme,
 mare, siti, piante, animali, herbe, fiori, le quali sonno
 cinte d'ombra e lume. Et veramente questa è scientia et
 legitima figlia de natura, perché la pittura è partorita
 da essa natura, ma per dir più corretto, diremo nipota de 10
 natura perché tutte le cose evidenti sonno state partorite
 dalla natura delle quali cose è nata la pittura. Adonque,
 rettamente la chiamaremo nipota d'essa natura et parente
 d'Iddio.

13

Come il pittore è signore d'ogni sorte di gente et di tutte le cose

Se'l pittore vol vedere bellezze che lo innamorino, lui
 è signore di generarle, et se vol vedere cose mostruose che
 spaventino o che sieno bufonesche, e risibili o veramente 5
 compassionevole, lui ne signore et Dio. Et se vol generare
 siti e desserti, lochi ombrosi o foschi ne' tempi caldi, lui

12 8 lume. Et] ~ ^ et OR

12 pittura. Adonque] ~ , adonque OR

13 1 Come] ED preceding this word in left margin in four lines: "Il pittore è Se di tutte le cose che possono cadere in pensiero dell' omo però che s'egli ha desiderio di."; d'ogni] OR "g" altered from "n"

3 lui è signore] egli pero e, signore ED "lui e" deleted and "egli p[er]o e" interlined above

6 compassionevole, lui ne signore et dio. Et] ~ ^ ~ ~ ~ ~ ^ et OR; compassionevoli ^ et nei ~ ~ creatore ^ et ED "e" altered to "i" in "compassionevole, "lui" deleted and "et" interlined above, "i" interlined above and after "ne", "dio" deleted and "creatore" interlined above*; Dio. Et] dio ^ et OR

7 foschi] freschi ED interlined above deleted "foschi"

12 Ms. A, f. 100r

7 mare] aire e

8 questa] "arti è" interlined and deleted after "questa"

12 cose] cose partorite

12. How Whoever Scorns Painting Loves Neither Philosophy Nor Nature

If you would scorn painting, which is the sole imitator of all the perceptible works of nature, you will certainly be scorning a subtle invention, which considers all the qualities of forms with philosophy and subtle speculation—seas, sites, plants, animals, grasses, [and] flowers, which are enveloped in shadow and light. Truly this is science and the legitimate child of nature because painting is born of nature; but, to be more correct, we should say [that painting is] the grandchild of nature because all perceptible things are born from nature, and painting is born from the nature⁴² of those things. So, strictly, we shall speak of it as the grandchild of nature and kin to God.

13. How the Painter is the Lord of Every Kind of People and of All Things

If the painter wants to see beauties with which he will fall in love, he is a lord who can generate them, and if he wants to see monstrous things which may terrify or be buffoonish, and be laughable or truly arouse compassion, he is their lord and God.⁴³ If he wants to generate sites and deserts, shady or cool retreats from

⁴² In “dalla natura delle,” “natura” is the object of “da” and the antecedent of the “de.” As *Ms. A* clarifies, “natura” in this condensed structure refers to two kinds of nature: physical nature, and nature meaning “kind,” “type of,” or “intrinsic to.” This meaning is more obvious in *Ms. A*: “partorite” (deleted in the *Codex Urbinas*) comes after “cosa” (“things which are born”). Kemp/Walker translates “because all visible things have been brought forth by nature and it is among these that painting is born.”

⁴³ The sixteenth-century editor altered “dio” to “creatore.” See Commentary.

li figura e così lochi caldi ne' tempi freddi. Se vol
valli, se vole delle alte cime de monti scoprire gran
campagne, et se vole dopo quelle vedere l'orizzonte del 10
mare, egli n'è signore; et se delle basse valli vol vedere
li alti monti, o delli alti monti le basse valli e spiagge
et, in effetto, ciò che ne l'universo per essentia,
pressentia, o imaginatione, esso l'ha prima nella mente e
poi nelle mani. E quelle sono de tanta eccellentia che in 15
pari tempo generano una proportionata armonia in un solo
sguardo qual fano le cose.

14

Del poeta e del pittore

La pittura serve a più degno senso che la poesia, e fa
con più verità le figure de l'opere de natura ch'el poeta.
Et è molto più degne l'opere de natura che lle parole, che
sono hopera de l'homo perché tal proportionione è da l'hopere 5
de li homini a quelle della natura qual è quella che è da
l'homo a Dio. Adonque è più degna cosa l'imitare le cose
di natura, che è le vere similtudini in fatto che con
parole imitare li fatti e parole de gli homini. Et se tu,
poeta, voi descrivere l'hopere de natura cola tua semplice 10
professione, fingendo diversi siti e forme de varie cose, tu
sei superato dal pittore con infinita proportionione di
potentia. Ma se voi vestirti de l'altrui scientie separate
da essa poesia, elle non sono tue, come Astrologia,

- 13 8 freddi. Se] ~ ^ se OR "d" altered from "b"; valli] ED followed by "al simile"
interlined after "le"
10 vedere] OR preceded by deleted "scoprire"
14 nella] nella ED altered from [?] "niella"
15 mani. E] ~ ^ e OR
- 14 1 Del poeta e del pittore] ED interlined in left and upper margins: "Sarà miglior
dire Come la Pittura serve a più degno senso che La Poesia"
3 poeta. Et] ~ ^ et OR
4 è] sono ED "sono" interlined above deleted "e"
5 hopera] OR "h" interlined above "o"
6 de li] delli ED "l" added
7 Dio. Adonque] dio ^ adonque OR
8 che è] che sono ED "sono" interlined above deleted "e"
9 homini. Et] ~ ^ et OR
13 potentia. Ma ^] ~ ^ ma, OR; scientie] sientie OR; scientie ED "c." inter-
lined above "i"
14 poesia] poeia OR; poesia ED "s" interlined above "ei"; come] como ED "e"
altered to "o"

hot weather, he makes them appear, and also warm places in cold weather. If he wants valleys, if he wants to discover a great countryside from the high crests of mountains; and if, after that, he wants to see down to the horizon of the sea, he is lord to do so; if from the deepest valleys he wants to see the highest mountains or, from the highest mountains the deepest valleys and the seashores. In effect, whatever there is in the universe by essence, presence, or imagination, the painter has it first in his mind and then in his hands, which are of such excellence that in an equal time they generate a proportioned harmony, as things do in a single glance.⁴⁴

14. About the Poet and the Painter

Painting acts through a more noble sense than poetry, and renders the figures of the works of nature with more truth than the poet [does]. And the works of nature are far more worthy than words, which are the works of man, because there is the same proportion between the works of man and the works of nature as between man and God. Therefore, it is a more worthy thing to imitate things in nature, which are actual similitudes⁴⁵ in fact, than to imitate facts and the words of men in words. And if you, poet, want to describe the works of nature with your simple profession, by feigning different places and the forms of various things you will be overcome by the painter's infinitely [greater] proportion of power. Now if you clothe yourself in other sciences separate from the science of poetry—like astrology, rhetoric, theology, philosophy, geometry,

⁴⁴ The antecedent of "quelle" could be "mente" and "mani" or just "mani." Restricting "quelle" to its immediate antecedent as a demonstrative pronoun, the contrast is between the act of the mind and the hands, which act just as fast: the artist *makes* things in a single glance. Other translators interpret the artist's productions to be *seen* in a single glance. Richter: "these . . . are able to present a proportioned and harmonious view of the whole that can be seen simultaneously, at one glance . . ." McMahon: "these have created a proportioned harmony reflecting things in nature as seen in a single glance." Kemp/Walker: ". . . and then in his hands and these are of such excellence that they can generate a proportional harmony in the time equivalent to a single glance, just as real things do." See Commentary.

⁴⁵ See n. 5.

Rettorica, Teologia, Filosofia, Geometria, Aristmetica, et 15
 simili, tu non sei allora poeta, tu ti trasmuti, e non sei
 più quello di che qui si parla. Hor non vedi tu che, se tu
 voi andare alla natura, che tu vi vai con mezzi de scientie
 fatte d'altrui sopra li effetti de natura? Et il pittore
 per se senza aiuto de scientiali o d'altri mezzi, va 20
 immediate alla imitatione d'esse opere di natura. Con
 questa si move li amante in verso li simulacri della cosa
 amata a parlare con le imitate pitture. Con questa si move
 li populi con infervorati voti a ricercare li simulacri
 delli iddij, et non un vedere l'opere de poeti, che con 25
 parole figurino li medesimi iddij. Con questa s'ingannano
 li animali. Già vido io una pittura che inganava il cane
 mediante la similitudine del suo patrone, alla quale esso
 cane facea grandissima festa. Et similmente ho visto li
 cani baiare et voler mordere li cani depinti, et una scimmia 30
 far infinite pazzie contro ad un'altra scimmia depinta. Ho
 veduto le rondini volare e possarsi sopra li ferri depinti
 che sportano fuori delle finestre delli edifitij.

15

Essempio tra la poesia e la pittura

Non vede la imaginatione cotal eccellentia qual vede
 l'occhio, perché l'occhio riceve le spetie, ovvero
 similitudini de li obbietti, et dà lle alla impressiva et
 dà essa impressiva al senso comune, et li è giudicata. 5
 Ma la imaginatione non esse fuori d'esso senso comune, se

15 Geometria] geometria OR; Geometria Ed "g" altered to "G"

17 parla. Hor] ~ ^ hor OR

18 vai] vai OR "v" altered

19 natura? Et] ~ , et OR; sanza] OR first "z" deleted in "sanza"

21 opere] OR "h" deleted from "hopere"; natura. Con] ~ ^ con OR

22 li amante] OR final "e" altered from "i"; ne li amante ED "ne" interlined above space preceding "li"; in] ED deleted "in"; li] ne ED "ne" added after deleted "li"

23 pitture. Con] ~ , con OR

24 li] no li ED "no" interlined above space preceding "li"; ricercare] riercare OR; ricercare ED "c" interlined above "e"

26 iddij. Con] ~ , con OR

27 animali. Gia] ~ ^ gia OR

29 festa. Et] ~ , et OR; visto] illegible OR; verso ED interlined over altered and deleted [?] "visto"; li] I ED "i" altered and "i" deleted

31 depinta. Ho] ~ ^ ho OR

33 edifitij] ED followed by: "tutte operationi del pittore maravigliosissime"

15 5 giudicata. Ma] ~ ^ ma OR

arithmetic, and so forth—they are not yours. And similarly, you are no longer a poet, you have transmuted⁴⁶ yourself, and you are no longer considered here. For do you not see that if you go to nature, you go with the means of sciences made by others about the effects of nature? And the painter, by himself, goes immediately to the imitation of those works of nature, without the aid of scientific or other means. Thereby lovers are moved by the simulacra⁴⁷ of their beloved to speak with painted imitations. Thereby, with fervent vows, people are moved to seek out the simulacra of gods, and not the sight of the works of poets which figure the same gods with words. Thereby, animals are deceived. Once I saw a painting deceive a dog so that he most joyfully greeted the similitude⁴⁸ of his master. Similarly I have seen dogs bark and try to bite dogs in paintings, and a monkey did infinite crazy things in front of another, painted one. I have seen swallows fly to light on bars which have been painted so that they seem to project from the windows of buildings.

15. A Difference between Poetry and Painting

The imagination does not see as excellently as the eye sees, because the eye receives the species or similitudes of objects and gives them to the *impressiva*, and the *impressiva* gives it to the *senso comune*, and there it is judged;⁴⁹ but the imagination does not exist outside the common sense, except to go to the memory⁵⁰ where it stops and dies

⁴⁶ Richter translates “changed”; McMahon translates “transformed.” On the importance of “transmutation” to Leonardo’s scientific investigations, see Commentary.

⁴⁷ Generally meaning “likeness,” in this case “simulacrum” refers to a painted portrait. Compare the following sentence and see n. 29.

⁴⁸ A painted portrait, like “simulacrum” in the preceding sentence; but compare n. 5, where the reference is to the same word meaning the “likeness” of an object sensed by sight, derived from optical theory. In the present passage Leonardo plays upon the multiple meanings of these words; see Commentary.

⁴⁹ “Essa” and “e’ giudicata” refer to a plural subject. Richter renders “li” in “li e’ giudicata” as the direct object.

⁵⁰ Species, similitude, *impressiva*, *senso comune*, *imaginativa*, memory are terms in optics, faculty psychology: see n. 22 and Commentary.

non in quanto essa va alla memoria, et li si ferma et li
 muore se la cosa imaginata non è de molta eccellentia. Et
 in questo caso si trova la poesia nella mente overo
 imaginativa del poeta, il quale fingie le medesime cose del 10
 pittore, per le quali fintioni lui vol' equipararsi a esso
 pittore, ma in vero lui n'è molto remoto, come di sopra è
 dimostrato. Adonque, in tal caso di fintione diremo con
 verità esser tal proportionione dalla scientia della pittura
 alla poesia, qual'è dal corpo alla sua ombra derivativa, et 15
 anchora maggiore proportionione con ciò sia che l'ombra di tal
 corpo almeno entra per l'occhio al senso comune. Ma la
 imaginatione di tale corpo non entra in esso senso, ma li
 nasse in l'occhio tenebroso. O, che differentia è a
 immaginarsi tal luce in l'occhio tenebroso al vederla in atto 20
 fuori delle tenebre!

Se tu, poeta, figurerai la sanguinosa battaglia si sta
 con la oscura e tenebrosa aria mediante il fumo delle
 spaventevoli et mortali macchine, miste con la spessa
 polvere intorbidatrice dell'aria, e la paurosa fuga delli 25
 miseri spaventati dalla horribile morte, in questo caso il
 pittore ti supera, perché la tua penna sia consumata
 inanzi che tu descriva a pieno quel che imediate il pittore
 rapresenta con la sua scientia.

Et la tua lingua sara impedita dalla sete, et il corpo 30
 dal sonno e fame, prima che tu con parole dimostri quello che
 in un istante il pittore ti dimostra. Nella qual pittura
 non manca altro che l'anima delle cose finte, ed in
 sciascun corpo è la integrita de quella parte che per un
 solo aspetto può dimostrarsi. Il che longa et tediosissima 35
 cosa sarebbe alla poesia a ridire tutti li movimente delli
 operatori di tal guerra, et le parti delle membra e loro

7 et li muore] e muore ED "e" intelined above deleted "et li"

8 eccelentia. Et] ~ ^ et OR

9 nella] nel a OR

10 fingie] filgie[?] ED "n" altered to [?]"i"

11 equipararsi] ED interlined above: "eguagarsi"

12 remoto] ED interlined above: "lontana"

13 dimostrato. Adonque] ~ ^ adonque OR; con] OR altered from "non"

18 comune. Ma] ~ , ma OR

19 tenebroso. O] ~ ^ o OR

20 immaginarsi] imaginar OR "si" deleted from "immaginarsi"

21 tenebre!] ~ , OR

24 con la] in una ED interlined above "con la"

32 dimostra. Nella] ~ , nella OR

35 dimostrarsi. Il] ~ , il OR

if the thing imagined is not of great excellence. This is the case in which poetry arises in the mind or the *imaginativa* of the poet who feigns the same things as the painter. [The poet] wishes to be considered the equal of the painter for these fictions, but in truth he is far removed, as has been demonstrated above. Therefore, with regard to the fictions [of poets], it would be true to claim that there is the same proportion between the science of painting and poetry as there is between the body and its derivative shadow.⁵¹ And yet the difference is even greater than regards the proportion with the shadows of the body, which at least enters the *senso comune* through the eye. But the imagination of such a body does not enter into that sense, but is born in the tenebrous eye.⁵² O, what a difference there is between imagining such a light in the tenebrous eye and seeing it in action outside the darkness!

Poet, what if you had to figure a bloody battle mixed with air obscured and darkened by the smoke of frightening and deadly machines, mixed with the thick, torbid dust of the air and the panicky flight of wretches afraid of horrible death? In this case the painter will surpass you because your pen will be consumed before you have fully described what the painter presents to you immediately using his science.

And your tongue will be impeded by thirst, your body by sleep and hunger, before you demonstrate with words what a painter demonstrates to you in an instant. His painting lacks only the soul of the things feigned, and the integrity of the parts of each body can be demonstrated in a single view.⁵³ It would be a long and very tedious thing for poetry to relate all the movements of the participants in such warfare, and the parts of their limbs and their

⁵¹ Cast shadow. See Commentary.

⁵² The "tenebrous eye" is the inner chamber of the imagination. Richter translates "darkness of the mind's eye." McMahon translates: "in the absence of the function of the eye the image of that body does not become known to the senses, but remains where it originates." He translates the adjacent phrases: "imagining a light while the eye is in darkness," and "the shadow of such a body achieves sensory perception through the eye."

⁵³ Richter translates inaccurately: "each figure is represented so as to show completely that part which faces the given direction."

ornamenti. Delle quali cose la pittura finita co' gran
 brevità et verità ti pone inanzi, et a questa tal
 dimostrazione non manca se non il romore delle machine et 40
 le grida delli spaventanti vincitori et le grida e pianti
 delli spaventati. Le quali cose anchora il poeta no' pò
 rapresentare al senso de l'audito. Diremo adonque, la
 poesia essere scientia che somamente opera nelli orbi, et la
 pittura far il medesimo nelli sordi, ma tanto resta più 45
 degna la pittura quanto ella serve a miglior senso.

Solo il vero uffitio de poeta è fingere parole di
 gente ch'insieme parlino, et sol questo rapresenta al senso
 de l'audito tanto come naturali perché in sè sono naturali
 create dalla humana voce, e in tutte l'altre consequentie 50
 è superato dal pittore.

Ma molto più senza comparatione son le varietà in che
 s'astende la pittura, che quelle in che s'astende le parole
 perché infinite cose farà il pittore che le parole non le
 potrà nominare, per non havere vocaboli apropiati a 55
 quelle. Hor non vedi tu che, se'l pittore vol fingere animali
 o diavoli ne inferno, con quanta abbondanza de inventione
 lui transcorre?

Qual'è colui che non voglia prima perdere l'udire che
 l'odorato e il tatto, ch'el vedere? Perché chi perde il 60
 vedere è come un ch'è scacciato dal mondo, perché lui
 più nol vede nè nessuna sua cosa, e questa vitta è
 sorella della morte.

16

Qual è di maggior danno alla spetie humana, o perdere
 l'occhio o l'orecchio

Magior danno ricceve gli animali per la perdita del
 vedere che de l'udire più caggioni. E prima che

38 ornamenti. Delle] ~ ^ delli OR

42 spaventanti. Le] ~ ^ le OR

43 l'audito. Diremo] ~ ^ diremo OR

44 sommamente] ED abbreviation sign added over "m"

56 quelle. Hor] ~ , hor OR

58 transcorre?] ~ ^ OR

59 Qual'è] OR preceded by sign (delta)

60 vedere? Perché] ~ , perche OR

16 2 l'orecchio] OR followed by two signs (delta with 3 dots, and bar with dot
 above and below)

4 caggioni. E] ~ ^ e OR

ornaments. The finished painting places all those things before you with great brevity and truth, and nothing is lacking in such a demonstration,⁵⁴ unless it is the noise of the machines and the terrifying screams of the victors and the screams and cries of the terrified. These are also things which the poet cannot represent to the sense of hearing. Therefore, we will say that poetry is the science that most highly serves the blind, and painting does the same for the deaf. Yet painting is more honorable to the same [extent] that it acts through the better sense.

The only true duty of the poet is to feign the conversation of people, and only these words are presented naturally to the sense of hearing because only these words are created naturally by the human voice,⁵⁵ and in all other respects he is outdone by the painter.

Even more incomparable are the varieties [of things] which painting includes,⁵⁶ for the painter will do infinite things which words will not be able to name, by not having the vocabulary appropriate to the [actions]. So do you not see that, if the painter wants to feign animals or infernal devils, what an abundance of invention passes through him?

Who would not want to lose his [sense of] hearing, as well as smell and touch, before losing his [sense of] sight? For whoever loses his sight is like someone driven out of the world, because he cannot see any of it, and this life is the sister of death.

16. Which is the Greater Loss to the Human Species,⁵⁷ to Lose an Eye or an Ear?

Animals are harmed more by the loss of sight than by [the loss of] hearing, for many reasons. First, they need to see where to find

⁵⁴ “Demonstration” can refer to a mathematical proof, an inductive proof in the natural sciences, or a rhetorical figure; see Commentary to Chapter 19 for full discussion.

⁵⁵ Richter translates “[words] are natural phenomena in themselves.”

⁵⁶ Richter translates: “but the manysidedness painting commands is incomparably greater than can be attained by words.”

⁵⁷ Richter and McMahon translate “mankind.”

mediante il vedere il cibo è ritrovato donde si debbe 5
 nutrire, il quale è nescessario a tutti gli animali. El
 secondo che per il vedere si comprende il bello delle cose
 create, massime delle cose che inducono a l'amore. Nel
 quale il ciecho nato non pò pigliare per lo audito perché
 mai non ebbe nottitia che cosa fusse bellezza d'alcuna cosa. 10
 Restali l'audito, per il quale solo intende le voci et
 parlare humano, nel quale è nommi de tutte le cose, a chi
 è dato il suo nomme senza la saputa d'essi nommi. Ben si
 pò vivere lieto, come si vede nelli sordi nati, cioè li
 mutti che mediante il disegno, del quale il più de' mutti 15
 si diletta. Et se tu dirai ch'el vedere impedisse la
 fissa et sottile cognitione mentale, con le quale si penetra
 nelle divine scientie, et tale impedimento condusse un
 filossofo a privarsi del vedere, a questo si risponde che
 tal occhio, come signore de' sensi, fa suo debbito a dare 20
 impedimento alli confusi et bugiardi non scientie, ma
 discorsi, per li quali sempre con gran gridare et menar di
 mani si disputa, et il medesimo doverebbe fare l'audito, il
 quale ne rimane più offeso, perché lui vorrebbe accordo del
 quale tutti li sensi s'intrincano. Et se tale filossofo si 25
 trasse gli occhi per levare lo impedimento alli suoi
 discorsi, hor pensa che tal atto fu compagno dell cervello e
 de discorsi, perché tutta fu pazzia. Hor non potea egli
 serarsi gli occhi quando esso entrava in tale frenessia, e
 tanto tenerli serati che tal furore si consumasse? Ma pazzo 30
 fu l'homo, e pazzo il discorso, et stoltissimo il trarsi gli
 occhi.

6 animali. E] ~ ^ el OR

8 a l'amore. Nel] ~ ~ ^ nel OR

10 cosa. Restali] ~ ^ restali OR

13 nommi. Ben] ~ ^ ben OR

16 diletta. Et] ~ , et OR; fissa] OR preceded by deleted "vera"

19 questo] quesa[?] OR; questo ED [?] "a" altered to "to"

22 gridare] gridore OR

24 offeso] OR "o" altered from "e"

25 s'intrincano. Et] ~ ^ et OR; lo] li OR; lo ED "o" altered to "i"

26 suoi] soi OR

27 dell cervello] OR altered from "del cerverlo"

28 pazzia. Hor] ~ ; hor OR

30 consumasse? Ma] ~ ^ ma OR

food, by which to nourish themselves, as is necessary for all animals. Second, by sight they comprehend the beauty of created things, which is the greatest of the things that induce love. One born blind can never use the sense of hearing [instead] because he never had knowledge of what the beauty of any thing was.⁵⁸ The part left to the sense of hearing, which understands only voices and human speech, is the name of all things given to someone without the knowledge of what these names mean. Yet one can live happily, as is seen in those born deaf, namely mutes, who live through drawing, in which most mutes delight. If you say that sight impedes attention and the subtle mental cognition by which one penetrates into divine knowledge,⁵⁹ and that such an impediment led a philosopher to deprive himself of his sight, one responds to this by saying that the eye, as lord of the senses, does its duty by impeding confused and lying discourses which, unlike knowledge, are always disputed with great shouting and coming to blows;⁶⁰ and hearing, which is offended even more, should do the same since it seeks accord among all the senses involved. If such a philosopher took out his eyes to lift the impediment from his discourses, you may well consider that this act was a fit companion to his brain and his discourses, because all of it was crazy. Could he not have closed his eyes when frenzy overcame him, and kept them shut until the furor consumed itself? Yet the man was crazy, and crazy his discourse, and the most foolish thing of all was to tear out his eyes.

⁵⁸ Kemp/Walker translates: "because he would never be able to judge whatever might be beautiful."

⁵⁹ Kemp/Walker translates "sciences."

⁶⁰ Richter translates "waving of the hands;" McMahon translates "gestures of the hands;" Kemp/Walker translates "gesticulation."

17

Como la Scientia della astrologia nasse da l'occhio perché
mediante quello è generata

Nissuna parte è nella astrologia che no' sia uffitio
delle linee visuali e della prospettiva, figliola della
pittura, perché il pittore è quello che, per necessita 5
de la sua arte, ha partorito essa prospettiva, et no si pò
fare per sè senza linee dentro alle quali linee
s'inchiodono tutte le varie figure de' corpi generati dalla
natura. Senza le quali l'arte del geometra è orba. Et se'l
geometra reduce ogni superfitie circondata da linee alla 10
figura dell quadrato et ogni corpo alla figura del chubo, et
l'aritmetchica fa il simile con le suoi radici chube e
quadrate, queste due scientie non s'astendono se no alla
notitia della quantita continua et discontinua. Ma della
qualita no si travaglia, la qual'è bellezza de l'opere de 15
natura et ornamento del mondo.

18

Pittore che disputa col poeta

Qual poeta con parole ti mettera inanzi, o amate, la
vera effigie della tua iddea con tanta verita qual fara
il pittore? Quale sia quello che ti dimostrerà siti de'
fiumi, boschi, valli et campagne dove si rapresenti li tuoi 5
passati piaceri con più verita ch'el pittore? Et se tu
dici che la pittura è una poesia mutta per sé, se non
ti'è chi dicca, o parli per lei quello che la rapresenta?
O non t'avedi tu ch'el tuo libro si trova in peggiore grado
perché anchora che lui habbia un homo che parli per lui non 10

-
- 17 5 necessità] nescita OR; necessità ED interlined above deleted "nescita"
8 s'inchiodono] s'inchiede OR; s'inchiodono ED "e" altered to "o" and "no"
interlined above "e,"
9 natura. Senza] ~ ^ senza OR; orba. Et] ~ ^ et OR
14 discontinua. Ma] ~ , ma OR
18 1 Pittore] ED to left in margin in three lines: "La differenza chè dall'opere del
pittore a quelle del Poeta"
3 iddea] dea ED "id" deleted
4 pittore? Quale] ~ ^ quale OR
6 pittore? Et] ~ ^ et OR
8 ti è] Ludwig renders "v'è"; rapresenta? O] ~ , o' OR
9 libro] ED to right in margin in two lines: "la compositione del Poeta"

17. How the Science of Astrology⁶¹ is Born of the Eye Because Astrology is Generated by Means of the Eye

There is no part of astrology which is not the function of visual lines and perspective, the daughter of painting, because it is the painter who, by the necessity of his art, has given birth to perspective, in that painting can only be done with lines which enclose all the varied figures of bodies generated by nature. Without these [lines] the art of the geometer is blind. When the geometer reduces every surface surrounded by lines to the figure of the square and every body to the figure of the cube, as arithmetic does with its cube and square roots, [then] these two sciences do not extend beyond knowledge of continuous and discontinuous quantities. [These sciences] are not concerned with quality, with what is beautiful in the works of nature and the ornament of the world.

18. Painter Who Disputes with a Poet

O mistresses, what poet will place the true effigy of your deity⁶² before you with words as true as what the painter will do? What will demonstrate to you the course of rivers, forests, valleys, and countrysides representing where you have passed pleasures with more truth than the painter? And if you were to say that painting is a mute poem, is not [poetry] itself mute if there is no one to recite it, or to explain what it represents? Or do you not see that your book is a degree worse off [than painting] because, even if your book should have a man who speaks for it, you will see none of the things

⁶¹ Mathematical astrology, or astronomy.

⁶² Richter incorrectly translates “ideal.”

si vede niente della cosa di che si parla, come si vedera di quello che parla per le pitture. Le quali pitture, se saranno ben proportionati li atti con li loro accidenti mentali, elle saranno intese come se parlassino.

19

Come la pittura avanza tutte l'opere humane per sottile speculatione apertenente a quella

L'occhio, che si dice finestra de l'anima, è la principal via donde il comune senso pò più coppiosa et magnificamente considerare le infinite opere de natura, et l'orecchio è il secondo, il quale si fa nobile per le cose raconte le quali ha veduto l'occhio. Se voi istoriograffi, o poeti o altri matematici, non havestive con l'occhio visto le cose, male le potresti voi riferire per le scritture. Et se tu poeta, figurerai una istoria con la pittura della penna, il pittore col penello la fara di più faccile satisfactione et meno tediosa ad essere compresa. Se tu dimanderai la pittura mutta poesia, anchora il pittore potra dire la poesia orba pittura. Hor guarda quale è più dannoso mostro, ol cieco ol mutto. Se'l poeta è libero, come 'l pittore, nelle inventioni, le sue finctioni non sonno di tanta satisfactione alli homini quanto le pitture. Perché, se la poesia s'astende con le parolle a figurare forme, atti e siti, il pittore si move con le proprie similitudini delle forme a contraffare esse forme. Hor guarda qual è più propinquo a l'homo, ol nome de homo

11 cosa] ED to right in margin: "∧ ch'ella"; le] ED to right in margin: "Lei"

12 pitture. Le] ~ ∧ le OR

14 elle] ED deleted "elle"

19 2 apertenente] apertenenti ED third "e" altered to "i"

7 l'occhio. Se] ~ , se OR

9 scritture. Et] ~ , et OR; istoria] Istoria ED "i" altered to "I"

12 compresa. Se] ~ ∧ se OR

14 pittura. Hor] ~ ∧ hor OR; è] e OR

15 mutto. Se'l] ~ ∧ s'el OR

18 pitture. Perché] ~ ∧ per che OR

19 figurare] Ludwig amends to "figura"

20 forme. Hor] ~ ∧ hor OR

19 Ms. A, f. 99r-v

14 poesia orba] poeta orba

15 mostro] morso

that are spoken of, as you will see them expressed through paintings. When the actions are well-proportioned to their mental accidents,⁶³ paintings will be understood as if they could speak.

19. How Painting Surpasses All the Works of Man on Account of the Subtle Speculations With Which It is Concerned⁶⁴

The eye which is said to be the window of the soul, is the principal means by which *senso comune* may so copiously and magnificently consider the infinite works of nature, and the second way is the ear, made noble by being told about things that the eye has seen. If you historiographers or poets or mathematicians, had not seen things with your eyes, badly would you be able to refer to them through your writings. Poet, if you were to figure a narrative⁶⁵ as if painting with your pen, the painter with his brush would more easily make it satisfying and less tedious to comprehend. If you claim that painting [is] mute poetry, then the painter could say that poetry [is] blind painting. Now consider which is the more damaging monstrosity,⁶⁶ to be blind or to be mute. If the poet, like the painter, is free in his inventions, [the poet's] fictions are not as satisfying to men as paintings [are]. For, while poetry extends to the figuration of forms, actions, and places in words, the painter is moved by the real similitudes⁶⁷ of forms to counterfeit these forms. Now consider which is a closer examination of man,⁶⁸ his name or

⁶³ Richter translates “states of mind;” McMahon translates “mental attitudes.” See Commentary.

⁶⁴ The original of this passage is extant in *Ms. A*, f. 99r–v. Variations are given in the Apparatus. See Commentary.

⁶⁵ “Narrative painting.” Leonardo’s text derives from Alberti; see Spencer, Introduction, Alberti, *On Painting*, 23–28. See also Commentary.

⁶⁶ *Ms. A*: “morso” (“bite,” or more idiomatically, “sting”). “Mostro” (“monstrosity”) is an emendation made by the sixteenth-century editor.

⁶⁷ See n. 5.

⁶⁸ Literally “more in proximity to man.”

o la similitudine d'esso homo? Il nome de l'homo si varia
in varij paesi et la forma non è mutata se no' per morte.
Et se il poeta serve al senso per la via de l'orecchio, il
pittore per la via del'occhio più degno senso. Ma io non
voglio da questi tali altro che uno bono pittore che figuri
'l furore d'una battaglia, et ch'el poeta ne scrivi
un'altra, e che sieno messi in pubblico de compagnia.
Vedrai dove più si fermeranno li veditori, dove più
consideraranno, dove si dara più laude, et quale
sattisfara meglio. Certo la pittura, di gran longa più
utile et bella, più piacerà. Pone in scritto il nome
d'Iddio in un locho, et ponni la sua figura a riscontro,
vedrai quale si più reverita. Se la pittura abbraccia in
sè tutte le forme della natura, voi non havete se non li
nomi, li quali non sonno universali come le forme. Se voi
havete li effetti delle dimostrazioni, noi habbiamo le
dimostrazioni delli effetti.

Tolgassi un poeta che descriva le bellezze d'una donna
al suo innamorato, et tolgassi un pittore che la figuri,
vedrassi dove la natura volgera più il giudicatore
innamorato. Certo il cimento delle cose dovrebbe lasciare
dar la sententia alla sperientia. Voi havete messa la
pittura fra l'arti mechaniche. Certo, se i pittori fussero

-
- 22 homo? Il] ~ ^ il OR
23 morte. Et] ~ , et OR
25 senso. Ma] ~ , ma OR
28 compagnia. Vedrai] ~ ^ vedrai OR
31 meglio. Certo] ~ ^ meglio OR
32 piacerà. Pone] ~ , pone OR
34 reverita. Se] ~ , se OR
36 forme. Se] ~ ^ se OR
39 tolgassi] tolgassi OR
42 innamorato. Certo] ~ ^ certo OR
43 alla] OR altered from "ala"; sperientia. Voi] ~ ^ voi OR
44 mechaniche. Certo] ~ ^ certo OR
-

Ms. A, f. 99r-v

- 25 per la via] per
26 altro che] altro se non che; che uno] ono; che figuri] figuri
29 Vedrai dove più si fermeranno li veditori] vederai i veditori dove piu si
fermeranno
30 laude] lalde; sattisfara] sadisfara
32 in scritto] scritto
39 Tolgassi] no new paragraph
40 et tolgassi] tali; Vedrassi] vederai
41 volgera] voltera'
44 fra] infra

his similitude? The name for man varies in different lands, and the form is mutated only by death. And if the poet acts through the senses by way of the ear, the painter [does so] by way of the more worthy sense of the eye. By these [comparisons] I only wish for a good painter to figure the fury of a battle, and for the poet to write something about it, and for both [of these battles] to be put before the public. You will see which will stop more viewers, which they will consider longer, which will be given more praise, and which will satisfy more. Certainly the painting, a great deal more useful⁶⁹ and beautiful, will please more. Place the name of God in writing in a place and, if you set up his figure opposite this, you will see which is the more revered. While painting embraces all the forms of nature within itself, you have only the names, which are not universal like the forms. If you have the effects of demonstrations,⁷⁰ we have the demonstrations of effects.

Take a poet who describes the beauties of a lady to her lover, and take a painter who figures her, you will see where nature will lead the enamoured judge. Certainly the test of things ought to let experience be the judge. You have placed painting among the mechanical arts. Certainly, if painters acted as you do to praise

⁶⁹ Richter inaccurately translates "intelligible."

⁷⁰ See n. 54. The science of painting demonstrates the causes of nature, which are afterwards described in words, and poetry pertains only to words. See further, Commentary.

atti a laudare col scrivere l'opere loro, come voi, credo 45
 non giaccerebbe in così vile cognome. Se voi la chiamate
 mechanica perché è prima manuale, che le mani figurano
 quello che trovano nella fantasia, voi scrittori, disegnando
 con la penna manualmente quello che nello ingegno vostro si
 trova. Et se voi diceste essere mechanica perché si fa a 50
 presso, chi cade in questo errore, s'errore pò chiamarsi,
 più di voi? Se voi leggete per li studi, non handate da chi
 più vi premia? Fate voi alchuna opera senza qualche premio?
 Benché questo non dico per biassimare simili opinioni,
 perché ogni fatica aspetta premio. Et potra dire un poeta, 55
 io farò un fintione che significara cose grande, questo
 medesimo fara il pittore, come fece Apelle la Calunnita.
 Se voi dicesti la poesia è più etterna, per questo dirò
 essere più etterne l'opere d'un calderaio ch'el tempo più
 le conserva che le vostre o nostre opere, niente di meno è 60
 de poca fantasia. Et la pittura si può depingendo sopra
 rame con colori di vetro farla molto più etterna. Noi per
 arte possiamo esser detti nipoti a Dio. Se'lla poesia
 s'astende in filosofia morale, et questa in filosofia
 naturale. Se quella describe l'operationi della mente, che 65
 considera quella se la mente opera nei movimenti. Se quella
 spaventa i populi con le infernali fintioni, questa con le

45 cognome. Se] ~ ^ se OR

46 disegnando] OR "i" altered from "e" and first "s" deleted; Ludwig renders "dissegnate"

50 trova. Et] ~ , et OR; diceste] ED altered from [?] "dicesul"

52 voi? Se] ~ , se OR; leggete] legg [?] iete OR; leggete ED "ie" altered to "e"

53 premia? Fate] ~ ^ fate OR; senza] senza OR; premio? Benché] ~ , benche OR

54 opinioni] ED "operationi" added to left in margin

55 premio. Et] ~ ^ & OR

57 Calunnita. Se] calunnita ^ se OR

61 fantasia. Et] ~ , et OR

62 etterna. Noi] ~ ^ noi OR

63 Dio. Se'lla] dio, s'ella OR

65 naturale. Se] ~ ^ se OR

66 movimenti. Se] ~ ^ se OR

Ms. A, f. 99r-v

45 credo] io dubito

46 giaccerebbe] diacierebbe; così] si

47 prima] opera

50 diceste] dicessi

51 po chiamarsi] so po chiamare

52 handate da] handate voi a

56 significarà] significha

58 dicesti] diciessi; questo diro] questo io diro

66 se] che

their work with writings, I believe painting would not have been given such a vile surname. If you call painting mechanical because at first it is manual, the hands figure what is found in the *fantasia*,⁷¹ and you writers draw what you find in your *ingegno*⁷² manually with the pen. If you say [painting] is mechanical because it is done for a price, who falls into this error more than you do, if it can be called an error? When you read in studios⁷³ do you not go to whoever awards you the greatest prize? Do you ever work without some reward? Yet I do not say this to blame such opinions, because every labor expects its reward. If a poet is able to say that he makes a fiction which will signify great things, the painter will do the same, as when Apelles made the *Calumny*.⁷⁴ If you say that poetry is more eternal, I would say to this that the works of a coppersmith are even more eternal in that time conserves them longer than yours or ours; nonetheless, [the work of a coppersmith] is of less *fantasia*. And a painting can be painted on copper with enamel colors to make it more eternal. By our art we can be called grandchildren of God. If poetry embraces moral philosophy, [painting embraces] natural philosophy. If [poetry] describes the operations of the mind, [painting] considers how the mind works in movements. If poetry terrifies people with fictional hells, [painting], with the same things

⁷¹ An alternate term for the *imagination*; see Commentary, CN 2.

⁷² In Leonardo's usage, "ingegno" is almost indistinguishable from "fantasia," as this sentence suggests; see preceding note.

⁷³ Humanists instructed outside the university in "studios," like the famous "Studio Pavese." Richter translates "if you read for instruction;" McMahon translates "if you lecture in classrooms."

⁷⁴ A lost painting described by Lucian and mentioned by Alberti, who was probably Leonardo's direct source. See Commentary.

medesime cose in atto, fa il simile. Pongassi 'l poeta a
 figurare una bellezza, una fierezza, una cosa neffand' e
 brutta, una mostruosa, col pittore. Faccia a suo modo come
 vole trasmutatione di forme. Ch'el pittore non sattisfaccia
 più, no s'egli intanto pitture hauto tanta conformita con
 la cosa imitata che la ingannato homini et animali? 70

20

Differentia che ha la pittura con la poesia

La pittura è una poesia che si vede e non si sente, et
 la poesia è una pittura che si sente et non si vede.
 Adonque, queste due poesie, o voi dire due pitture, hanno
 scambiati li sensi per li quali esse dovrebbero penetrare 5
 allo intelletto. Perché, se l'una et l'altra dei passare
 al senso comune per il senso più nobile, cioè l' occhio,
 et se l'una et l'altra è poesia, esse hanno a passare per
 il senso meno nobbile, cioè l'audito. Adonque, daremo la
 pittura al giudiccio del sordo nato, et la poesia sara 10
 giudicata dal ciecho nato. Et se la pittura sara figurata
 con li movimenti appropriati alli accidenti mentali delle
 figure che operano in qualonque caso, senza dubbio il sordo
 nato intendera le operationi et intentioni de li operatori,
 ma 'l ciecho nato non intendera mai cosa che dimostri 'l 15
 poeta. La qual faccia honore a essa poesia, con ciò sia
 che delle nobbili sue parti è il figurare li gesti et li
 componimenti delle istorie, et li siti ornati e dilettevoli
 con le trasparenti acque, per le quali si vede li
 verdeggianti fondi de li suoi corsi scherzare l'onde sopra 20
 prati e minute giarre con l'erbe, che con lor si mischiano

68 simile. Pongassi 'l] ~ ^ pongassi ~ OR

70 pittore. Faccia] ~ ^ faccia OR

71 forme. Ch'el] fome, ch'el OR; forme, ch'el ED "r" interlined above "om"

72 intanto] [?] visto ED interlined above deleted "intanto"; hauto] ED preceded by interlined "haver" above "hauto"

73 la] [?] hano ED interlined above deleted "la"; animali?] ~ , OR

20 3 vede. Adonque] ~ ^ adonque OR

6 intelletto. Perché] ~ ^ perche OR

9 l'audito. Adonque] ~ , adonque OR

11 nato. Et] ~ ^ et OR

16 poeta. La] ~ ^ la OR

Ms. A, f. 99r-v

19 71 sattisfaccia] sadisfaci

73 imitata] viva

in action, does the same. Suppose you pit a poet against a painter to figure one beautiful, high-spirited thing, and one nefarious and ugly thing, a monstrosity. [The painter] does this according to his mode of transforming the forms however he wants. What would satisfy a painter more,⁷⁵ if not paintings which conform to the thing imitated so much that they deceive both men and animals?

20. Painting and Poetry Have Differences

Painting is a poem that is seen and not heard, and poetry is a painting that is heard and not seen. So these two poems, or paintings so to speak, have exchanged the senses by which they should penetrate the intellect. For if both are painting, both pass to the *senso comune*⁷⁶ by the most noble sense, which is the eye. And if both are poetry, they have to pass [there] by the less noble sense, which is [the sense of] hearing. So we will let painting be judged by a man born deaf, and poetry be judged by one born blind. And if a painting is figured with movements appropriate to the mental accidents⁷⁷ of the participants, without any doubt the man born deaf will understand the workings and the intentions of the participants in every case, but the man born blind will never understand anything that the poet demonstrates. [The poet] who does honor to his poetry does so because of the nobility of its parts: to figure gestures and the components of narratives⁷⁸ and places embellished and made delightful by transparent waters where, in the verdant depths coursing waters play like waves over meadows, where wriggling fish mix with minute stones and grass, and where similar

⁷⁵ Richter translates “whatever variety of forms he may in this way produce, the painter will satisfy more.” McMahon translates “and let the painter work in his own way, transmuting forms as he pleases and the painter will satisfy more.”

⁷⁶ See n. 22.

⁷⁷ See n. 63.

⁷⁸ See n. 65.

insieme con li sguiscianti pessi, et simili discretioni. Le
 quali si potrebono così dire ad un sasso come a un ciecho
 nato perché mai vide nisuna cosa di che si compone la
 bellezza del mondo, cioè lucce, tenebre, colore, corpo, 25
 figura, sito, remotione, propinquità, moto e quiete, le
 quali sonno dieci ornamenti della natura. Ma il sordo,
 havendo perso il senso meno nobile, anchora 'egli habbia
 insieme persa la loquella perché mai udi parlare mai pote
 inparare alcun linguaggio, ma questo intendeva bene ogni 30
 accidente, che sia nelli corpi humani meglio che un che
 parli è che habbia udito; et similmente cognossera l'opere
 de pittori, et quello che in esse si rapresenti et a chi
 tali figure sieno propiate.

21

Che differentia è dalla pittura alla poesia

La pittura è una poesia mutta, et la poesia è una
 pittura ciecha, e l'una et l'altra va imitando la natura
 quanto è possibile alle loro potentie, e per l'una et per
 l'altra si po dimostrare molti morali costumi, come fecce 5
 Appelle con la sua Calunnia. Ma della pittura, perché
 serve a l'occhio senso più nobile che l'orecchio, obbietto
 della poesia, ne risulta una proportionione armonicha. Cioè
 che sì come di molte varie voci insieme aggiunte ad un
 medesimo tempo ne risulta una proportionione armonicha. La 10
 quale contenta tanto il senso de lo audito che li auditori
 restano con stupente admiratione quasi semi vivi, ma molto
 più fara le proportionali bellezze d'un angelico viso
 posto in pittura, della quale proportionalita ne risulta
 un armonico concento, il quale serve a l'occhio in un 15
 medesimo tempo che si faccia della musicha a l'orecchio. E
 sse tal armonia delle bellezze saranno mostrato allo amante

22 discretioni. Le] ~ ^ le OR

23 ciecho] OR preceded by deleted "sordo"

27 natura. Ma] ~ ^ ma OR

33 propiate] Ludwig amends to "appropriate"

21 6 Calunnia. Ma] ~ , ma OR

8 armonicha. Cioè] ~ ^ cioe OR

10 armonicha. La] ~ ^ la OR

14 in] OR preceded by deleted "sopra"

16 della] OR "del" interlined above "a"; l'orecchio. E sse] ~ ^ esse OR; ~ ^
 ch'e se ED "c'h" interlined above "e" and deleted "s"

17 saranno] sarà ED "no" deleted and accent mark added to "a"; mostrato]
 mostre OR; mostrata ED "e" altered to "a" and "ta" interlined above altered "e"

details⁷⁹ [are seen]. These details may as well be addressed to a stone as to man blind from birth because he has never seen anything of the beauty of the world, which is composed of light, darkness, color, body, figure, place, remoteness, propinquity, motion, and rest, which are the ten ornaments of nature. But the deaf man, having lost the less noble sense, even though he has lost it together with speech, which he never heard and so could never learn any language, will understand every accident of human bodies better than anyone who can speak and hear; and, similarly, he will understand the painter's works, and what is represented in them and who his figures are suited [to be].

21. What Differentiates Painting from Poetry

Painting is a mute poem and poetry is a blind painting, and both proceed by imitating nature as far as their powers make it possible, and many moral habits can be demonstrated through both of them, as did Apelles with his *Calumny*.⁸⁰ Yet a harmonic proportion results from painting because it serves the eye, a sense more noble than the ear, which is the object of poetry. This [proportion] is like the harmonic proportion which results when many varied voices are joined together at one and the same time. [This harmony] so delights the sense of hearing that listeners are as if half-alive stupefied with admiration, yet the beautiful proportions of an angelic face in a painting will do much more. A harmonic *concento*⁸¹ results from this proportionality which serves the eye at one and the same time, just as music serves the ear. If such a harmony of beauties is shown to the lover of whatever beauties are being

⁷⁹ The same word which means “descriptive details” later came to mean “discretion”; see Commentary.

⁸⁰ See n. 74.

⁸¹ Richter and Kemp/Walker translate “concord”; McMahon translates “ordered harmony”; Winternitz translates “concent [chord].” Winternitz, 1982, 205, notes that “the terms *chord* and, for that matter, *polyphony*, were not yet idiomatic in the musical treatises of Leonardo's time, although polyphonic musical practice used chords.”

di quella da chi tale bellezze sonno immitate, senza dubbio
 esso restara con istupenda admiratione et gaudio
 incomparabile e superiore a tutti gli altri sensi. Ma della 20
 poesia, la qual s'habbia a stendere alla figuratione d'una
 predetta bellezza con la figuratione particolare di ciascuna
 parte, della quale si compone in pittura la predetta
 armonia, non ne rissulta altra gratia che si faccessi a far
 sentire nella musicha ciascuna voce per sè sola in vari 25
 tempi, delle quali non si componerebbe alcun concento. Come
 se volessimo mostrare un volte a parte a parte, sempre
 ricoprendo quelle che prima si mostrano, delle quali
 demonstrationi l'obblivione non laccia comporre alcuna
 proportionalita d'armonia perché l'occhio non le abbraccia 30
 con la sua virtu vissiva a un medesimo tempo. Il simile
 accade nelle bellezze di qualonque cose finta dal poeta, le
 quali, per essere le sue parti dette separatamente in
 separati tempi, l' memoria non ne riceve alcuna armonia.

22

Differentia infra poesia e pittura

La pittura immediate ti si rapresenta con quella
 demonstratione per la quale il suo fattore l'a generata, et
 dà quel piacere al senso massimo, qual dare possa alcuna 5
 cosa creata dalla natura. E in questo caso il poeta, che
 manda le medesime cose al comun senso per la via da l'udito,
 minor senso, non dà a l'occhio altro piacere che s'un
 sentisse raccontare una cosa. Hor vedi che differentia è
 da l'udire raccontare una cosa che dia piacere a l'occhio
 con longhezza di tempo o vederla con quella prestezza che si 10
 vedono le cose naturali? Et anchora che le cose de poeti

19 admiratione] adiratione OR; ammiratione ED "m" with abbreviation sign
 interlined above deleted "d"

20 sensi. Ma] ~ ^ OR

23 predetta] Ludwig renders "perfetta"; ciascuna] ociscuna OR; ciascuna ED
 "cias" interlined above deleted "ocis"

26 concento. Come] ~ ^ come OR

31 tempo. Il] ~ ^ il OR

34 l' memoria] OR preceded by "l'armonia" and "armonia" deleted

22 2 immediate] immediate OR; immediate ED "n" altered to "m"

5 natura. E] ~ , è OR

8 cosa. Hor] ~ ^ hor OR; ~ , ED

9 l'udire] l'uedire OR; udire ED "ed" altered to "d"; longhezza] OR "o" altered
 from "u"

11 naturali? Et] ~ , et OR

imitated, without doubt he will be stupefied with admiration and incomparable joy and overcome in all of his other senses. Now a poem, which extends to the figuration of this designated beauty by the particular figuration of each part which composes the designated harmony in painting, does not result in any grace other than what is heard in music if each tone were [to be] heard only by itself at various times, which would not compose any *concento*.⁸² It is as if we would want to show a face part by part, always covering up the part which was shown before. Oblivion does not allow any proportionality of harmony to be composed because the eye does not embrace a proportionality with its visual virtue⁸³ at one and the same time in such demonstrations.⁸⁴ A similar thing happens with the beauties of anything feigned by the poet: since their parts are said separately at separate times, the memory does not receive any harmony from them.

22. The Difference between Poetry and Painting

Painting immediately presents you with the demonstration by which its maker generated it, and gives that pleasure to the greatest sense, as anything created by nature can. And in this case, the poet, who sends the same things to the common sense but by the lesser sense of hearing, does not give the eye any pleasure other than the pleasure of hearing a thing recounted. Now do you see what a difference there is between hearing a thing about something which pleases the eye recounted over a long period of time or seeing it with the immediacy that things in nature are seen? Even if things

⁸² See preceding note.

⁸³ See n. 7.

⁸⁴ Richter translates: “so that we are prevented in our forgetfulness from composing any harmony of proportions. . . .” McMahon translates similarly: “this would be an exhibition in which forgetfulness would disallow any harmonious proportion to be composed. . . .” Leonardo’s argument seems specifically indebted to late Scholastic science: see Commentary.

sieno con longho intervallo di tempo lette, spesse sonno le volte che le non sonno intese et bisogna farli sopra diversi comenti, de quali rarissime volte tali comentatori intendono qual fusse la mente del poeta et molte volte li lettori non leggano, se non piccola parte delle loro opere per dissaggio di tempo. Ma l'opera del pittore immediate è compresa dalli suoi risguardatori. 15

23

Della differentia et anchora similitudine che ha la pittura con la poesia

La pittura ti rapresenta in un subito la sua essentia nella virtu vissiva e per il proprio mezzo donde la impressiva ricceve li obbietti naturali, et anchora nel medesimo tempo nel quale si compone l'armonicha proportionalita delle parti che compongono il tutto che contenta il senso. Et la poesia refferisse il medesimo, ma con mezzo meno degno che l'occhio, il quale porta nella impressiva più confusamente et con più tardita le figurationi delle cose nominate. Che non fa l'occhio, vero mezzo infra l'obbietto et la impressiva, il quale immediate conferisse con somma verita le vere superfitie e figure di quel che dinanzi se gli apresenta, delle quali ne nasce la proportionalita detta armonia, che con dolce contento contenta il senso non altrimenti che si facciano le proportionalita de diverse voci al senso dello audito. Il quale anchora e men degno che quello de l'occhio perché tanto quanto ne nasse, tanto ne more, et è sì veloce nel morire come nel nassere. Il che intervenire non pò nel senso del vedere perché, se tu rapresenterai a l'occhio una bellezza humana composta de proportionalita de belle 20

12 tempo] temp OR; tempo ED "o" added after "p"; sonno] OR "s" altered from "n"

15 lettori] OR "i" altered from "e"

17 tempo. Ma] ~ ~ ma OR; l'opera] l'opere OR; l'opera ED "e" altered to "a"
23 7 proportionalità] proportionalia OR; proportionalita ED "t" interlined above final "a"; parti] OR preceded by deleted "quali"

8 senso. Et] ~ ^ et OR

10 impressiva] impressia OR; impressiva ED "v" interlined above "a"

11 cose] cosa OR; cose ED "a" altered to "e"; nominate. Che] ~ ^ che OR

13 vere] OR preceded by deleted "s"

17 audito. Il] ~ ^ il OR

20 nassere. Il] ~ ^ il OR

by poets are read over long intervals, often there are times when they are not understood and so several commentaries are needed on them. These commentators very seldom understand what was in the poet's mind and many times the readers will read only a small part of their works for want of time; whereas the work of a painter is comprehended immediately by his onlookers.

23. How Painting is Similar to Poetry, and about Their Differentiation

Painting, in an instant, presents its essence to your visual virtue by the same means⁸⁵ as the *impressiva*⁸⁶ receives natural objects. Furthermore, at the same time, a harmonic proportionality of the parts is composed that compose the whole which delights sense. Poetry refers the same things to the *senso comune* but by means less worthy than the eye, carrying the figuration of things which are named to the *impressiva* in a very confused and very slow manner. The eye, the true intermediary between the object and the *impressiva*, immediately transmits the true surfaces and figures of that which is presented directly facing it with the greatest veracity. From this is born the proportionality called harmony, which delights sense with sweet *concento*⁸⁷ no differently than the proportionality made by different tones delights the sense of hearing. Yet this [proportionality of the ear] is worth less than that of the eye because to the same extent that proportionality is born, so it dies, and it is as swift in dying as in being born. This intervention is not possible with the sense of sight because, if you would present the eye with a beautiful human being whose proportionality is com-

⁸⁵ McMahon translates "through the same medium."

⁸⁶ On these terms derived from medieval faculty psychology, see Commentary to Chapter 2.

⁸⁷ See n. 81.

membra, esse bellezze non sono sì mortali, nè sì presto
 si struggono, come fa la musicha. Anzi ha longha 25
 permanentia et ti si lassia vedere e considerare, et non
 rinasse come fa la musicha nel molto sonare, nè ti inducce
 fastidio. Anzi, inamora, et è causa che tutti li sensi
 insieme con l'occhio la vorebbon possedere, e pare che a
 garra vogliono combatter con l'occhio. Pare che la bocca se
 la vorebbe per sè in corpo, l'orecchio piglia piacere 30
 d'udire le sue bellezze, il senso del tatto la vorebbe
 penetrare per tutti li suoi meati, il naso anchora lui
 vorebbe friccevere l'aria ch'al continuo di lei spira. Ma
 la bellezza di tal armonia il tempo in pochi anni la
 destruggie, il che non accade in tal bellezza immitata dal 35
 pittore perché il tempo longhamente la conserva. Et
 l'occhio, in quanto al suo uffitio, piglia il vero piacere
 di tal bellezza dipinta, qual si facessi nella bellezza
 viva, manchali. Il tatto, il qual si fa maggior fratello,
 nel medesimo tempo il quale poi che hara hauto il suo 40
 intento, non impedisse la ragione del considerare la divina
 bellezza. Et in questo caso la pittura, immitata da quella,
 in gran parte supplisse il che suplire non potra la
 discretione del poeta. Il quale in questo caso si vole
 equiparare al pittore, ma no s'avede che'lle sue parole nel 45
 far mentione delle membra di tal bellezze, il tempo le
 divide l'un da l'altro et infra mette la obblivione et
 divide le proportioni. Le quali lui senza gran prolissita
 non può nominare et non potendole nominare, esso non può
 comporne l'armonicha proportionalita, la quale è composta 50
 de divine proportioni. Et per questo un medesimo tempo nel
 quale s'include la speculatione d'una bellezza depinta no
 può dare una bellezza descritta, e fa peccato contro

24 musicha. Anzi] ~ ^ anzi OR

27 fastidio. Anzi] ~ ^ anzi OR; insieme] nsieme OR

29 l'occhio. Pare] ~ ^ pare OR; se la] sella ED "l" added

32 lui] ED "lui" deleted

33 spira. Ma] ~ ^ ma OR

34 anni] OR "l" deleted from "lanni"; accade] OR altered from "acchde"

36 conserva. Et] ~ ^ et OR

39 manchali. Il] ~ ^ il OR

42 bellezza. Et] ~ ^ et OR

44 poeta. Il] ~ ^ il OR

45 equiparare] equiparare ED "c" deleted

48 proportioni. Le] ~ ^ le OR

51 proportioni. Et] ~ ^ et OR

52 s'include] sinclude OR; s'include ED

posed of beautiful members, these beauties are not as mortal, nor will they fade away as swiftly as music. On the contrary, it is permanent long enough to let you see and consider it, and does not need to be reborn as does music when it is played a lot, nor does it bore you. Instead, you fall in love with it, and the reason for this is that all the senses, together with the eye, long to possess it, and it seems that the other senses compete in wanting to do battle with the eye.⁸⁸ It appears that the mouth would like to swallow this being bodily, it seems that the ear takes pleasure in hearing about its beauties, the sense of touch would like to penetrate through all its pores, and the nose would like to inhale the air that this being continuously breathes.⁸⁹ Yet time destroys the beauty of this harmony in a few years. This does not happen when such a beauty is imitated by a painter, because time conserves [a painting] for quite a while. The eye, in keeping with its functions, takes true pleasure in such painted beauty, just as it does with living beauty, which is lost [over time]. At the same time, touch becomes the older brother of sight who, after having accomplished his aim, will not impede reason from considering divine beauty.⁹⁰ In this case painting, copied⁹¹ from divine beauty, supplies in great part what the poet's description⁹² will not be able to supply. If the poet wishes to make himself equal to the painter in this case, he does not take into account that when his words mention these beauties according to their members, time divides one from another and puts oblivion between each of them and divides the proportions. He cannot name the proportions without great prolixity, and in not being able to name them, he cannot compose their harmonic proportionality, which is composed of divine proportions. And thus, speculation on a beauty that is painted takes place at one and the same time; which cannot be the same as the time it takes for a beauty to be

⁸⁸ McMahon translates "all the senses vie with the eye in enjoyment." Kemp/Walker translates: "will make all your senses envious, as if they wished to emulate the eye."

⁸⁹ Kemp/Walker translates: "the nose would wish to inhale it with the air that it continually exhales."

⁹⁰ McMahon translates: "the satisfaction of touch is lacking, but at the same time it becomes an older brother, and although it will have known desire, this will not impede reason from considering divine beauty."

⁹¹ Richter translates "can take the place of the original"; McMahon translates "by re-creating."

⁹² See n. 79.

natura quel che si de' mettere per l'occhio, a volerlo
 mettere per l'orecchio, lasciavi entrare l'ufficio della 55
 musicha et non vi mettere la scientia della pittura, vera
 imitatricce delle naturali figure de tutte le cose. Che ti
 move, o homo, abandonare le proprie tue abbitationi della
 cita et lassiare li parenti e li amici, et attendare in
 luoghi campestri per monti et valli, se no la naturale 60
 bellezza del mondo, la quale, se ben consideri sol col senso
 del vedere, fruisci? Et s'el poeta vol in tal caso
 chiamarsi anchora lui pittore. Perché non pigliavi tali
 siti descritti dal poeta e startene in casa senza sentire il
 superchio calore del sole? O non c'era questo più utile 65
 e men fatica, perché si fa al fresco et senza moto o
 periculo de malatia? Ma l'anima non potea fruire il
 beneficio de li occhi, finestre delle sue habbitationi, e
 non potea riccevere le spetie de li allegri siti. Non potea
 vedere l'ombrese valli righate dallo scherzare delli 70
 serpeggianti fiumi, non potea vedere li varj fiori che con
 loro colori fanno armonia a l'occhio, et così tutte l'altre
 cose ad esso occhio rapressentar si possono. Ma s'el
 pittore nelli freddi et riggidi tempi d l'inverno, ti pone
 inanti li medessimi paesi depinti, od altri ne quali tu 75
 habbi riccevuto li tuoi piaceri? Apreso a qualche fonte
 tu possi rivedere te amante, con la tua amata nelli fioriti
 prati sotto le dolci ombre delle verdeggianti piante, non
 ricceverai tu altro piacere che ad udire tal effetto
 descritto dal poeta? Qui risponde 'l poeta et cede alle 80
 sopradette raggioni, ma dice che supera 'l pittore perché

57 cose. Che] ~ ^ che OR; abandonare] ad abandonare ED "ad ab" altered from "ab"

59 attendare] andare ED [?] "n" interlined above deleted "tten"

62 fruisci? Et] ~ ^ et OR

63 pittore. Perché] ~ ^ perché OR

64 startene] OR first "t" altered from "a"; sentire] sentite OR; sentire ED "r" interlined above "t"

65 sole? O] ~ , o OR; c'era] Ludwig renders "t'era"

67 malatia? Ma] ~ , ma OR; potea] potaa [?] OR; potea ED "e" altered from [?] "a"

68 beneficio] feneficio OR; beneficio ED "f" altered to "b"

69 siti. Non] ~ ^ non OR

70 scherzare] scherzare OR; scherzare ED "h" interlined above "e"

73 ad] ED preceded by interlined "ch" before "ad"; rapressentar] rappresenter ED "p" interlined above "ap" and first "s" deleted; possono. Ma] ~ ^ ma OR

74 l'inverno] l'inveno OR; l'inverno ED "r" interlined above "en"

76 riccevuto] riceuto OR; piaceri? Apreso] ~ ^ apreso OR

80 poeta? Qui] ~ , qui OR "poeta" preceded by deleted "pittore"

described,⁹³ and it is a sin against nature to wish to transmit by the ear what should be transmitted by the eye, to let the duty of music enter in place of the science of painting, which is the true imitator of all things by natural figures. What moves you, O man, to abandon your own dwelling in town and leave your relatives and friends⁹⁴ and go to rural places over mountains and valleys, if not for the natural beauty of the world which, although you observe it only through the sense of sight, you enjoy it? And if the poet also wants to call himself a painter, in this case he can. [But] why do you not accept the poet's description of these places and stay at home without suffering the excessive heat of the sun? Would this not be more practical and less tiring, since it is cool, and done without moving or danger of illness? Yet your soul would not be able to enjoy the beneficence of its eyes, the windows of its dwelling, and would not be able to receive the species of cheerful places. [The soul] would not be able to see the shaded valleys ruled by the play of serpentine streams, it would not be able to see the varied flowers whose colors make a harmony for the eye, and so all the other things which can be presented to the eye. Yet if a painter during the cold and severe times of winter sets the same landscape before you, or others like them, which are painted, will it not give you greater pleasure? If you have recently [passed] pleasures near springs when you can again see yourself as a lover with your beloved in flowering meadows under the sweet shadows of verdant trees, will your pleasure not be greater than hearing such effects described by a poet? At this point the poet responds and yields to these arguments, but he says

⁹³ Richter translates: "beauty cannot be described in words in the time which it takes to view beauty in a painting." McMahon translates: "the poet cannot describe a beauty in words during the time which is taken up by reflection on the beauty in painting." Neither translation conveys the sense of Leonardo's argument that visual beauty is grasped at one, indivisible moment of time.

⁹⁴ Richter incorrectly translates "parents."

lui fa parlare et ragionare li homini con diverse finttioni
 nelle quali ei finge con sè che non sono. Et che
 comoverà li homini a pigliare l'armi, et che descrivera il
 cielo, le stelle e la natura et l'arti e ogni cosa. Al 85
 quale si risponde, che nissuna di queste cose di che lui
 parla è sua proffessione propria, ma che se lui vole
 parlare et orare, è da persuadere ch'in questo gli è vinto
 da l'oratore, et se parla d'astrologgia, che l'ha rubato a
 lo astrologho, e de filossofia, al filosofo; e che in 90
 effetto la poesia non ha propria sedia, nè la merita
 altramente che d'un merchaio ragunatore de mercantie fatte
 da diversi artiggiiani. Ma la Deità della scientia della
 pittura considera l'opere, così humane come divine, le
 quali sono terminate dalle lore superfitie, cioè linee de' 95
 termini de' corpi. Con le quali lui comanda a lo scultore
 la perfettione delle sue statue. Questa, col suo principio,
 cioè il disegno, insegna allo architettore fare ch'el suo
 edificio si renda grato a l'occhio, questa alli componitori
 de diversi vasi, questa alli oreffici, tessitori, 100
 recamatori. Questa ha trovato li carateri con li quali
 s'esprime li diversi linguaggi, questa ha dato le caratte a
 li arismetici, questa ha insegnato la figuratione alla
 geometria, questa insegna alli prospettivi et astrologhi, et
 alli machinatori e ingegnieri. 105

24

De l'occhio

L'occhio del quale la bellezza de' l'universo è
 specchiata dalli contemplanti, è di tanta eccellentia che
 chi consente alla sua perdita si priva della representatione

- 83 con se] Ludwig renders "cose"; sono. Et] ~ ^ et OR
 85 cosa. Al] ~ ^ al OR
 89 da l'oratore] OR "dal" altered from "dll"
 90 filosofo;] ~ : OR
 92 altramente] ED interlined "al" above illegible deleted letter
 93 artiggiiani. Ma] ~ , ma OR
 96 corpi. Con] ~ ^ con OR
 97 statue. Questa] ~ ^ questa OR
 99 edificio] edificio OR
 101 recamatori. Questa] recamatori ^ questa OR
 105 ingegnieri] ingenrieri [?] OR; ingegneri ED "n" altered to "g" and "nieri"
 altered to "neri"
 24 1 L'occhio] ED "del occhio" interlined in top center margin above line begin-
 ning with "L'occhio"

that he surpasses the painter because, with diverse fictions in which he feigns that which is not, he makes men talk and reason. And he will rouse men to take up arms and he will describe the heavens, the stars, and nature and the arts and all things. To this, one responds that none of these things of which the poet speaks belong to his own profession; but if he wants to speak and makes orations, he needs to be persuaded⁹⁵ that he will be beaten by the orator; that if he talks about astrology, he robs the astrologer; and philosophy from the philosopher; so that, in effect, poetry, does not have its own place⁹⁶ and does not deserve one more than a monger who gathers merchandise made by different craftsmen [does]. Yet the deity of the science of painting considers human works as well as divine, [both of] which are bounded by their surfaces, that is, the lines at the boundaries of bodies. [The deity] directs the sculptor to perfect his statues by means of these lines. With his principle,⁹⁷ that is *dissegno*,⁹⁸ [the deity] teaches the architect to render his buildings agreeable to the eye; this is what teaches composers of different vases, goldsmiths, weavers, embroiderers. The characters by which different languages are expressed were discovered by this [principle] and this has given ciphers to the arithmeticians, this teaches figuration to geometry, and this teaches perspectivists and astrologers and makers of machines⁹⁹ and engineers.

24. On the Eye

For those who contemplate it, the beauty of the universe is mirrored in the eye, which is of such excellence that anyone who consents to its loss deprives himself of the representation of all the

⁹⁵ Richter inaccurately translates “[the poet] must admit. . . .”

⁹⁶ Place, as in a place among the liberal arts; or seat, as in a “seat of judgment.”

⁹⁷ Richter translates “beginning,” but from the context the designation of *dissegno* as a “principle” seems more likely.

⁹⁸ Drawing, or possibly design. See discussion of Leonardo’s notion of *dissegno* in the Commentary.

⁹⁹ Richter translates “mechanics”; McMahon translates “machinists,” but neither is adequate. Kemp/Walker translates “technicians.” See Commentary.

de tutte l'opere della natura. Per la veduta delle quali 5
 l'anima sta contenta nelle humane carceri mediante li occhi,
 per li quali essa anima si rapresenta tutte le varie cose
 de natura, ma chi le perde, lascia essa anima in una oscura
 priggione, dove si perde ogni speranza di riveder il sole,
 10 lucce di tutt' il mondo. E quanti so' quelli a chi le
 tenebre notturne sono sommo odio, ma anchora che'lle sieno
 de breve vitta? O, che farebbono questi, quando tali tenebre
 possino compagne della vitta loro? Et certo non è nissuno che
 non volesse più tosto perdere l'udito e l'odorato che
 15 l'occhio. La perdita del quale uddire consente la perdita di
 tutte le scientie ch'anno termine nelle parole, e sol fa
 questo per non perdere la bellezza l mondo, la quale
 consiste nelle superfitie de corpi, sì accidentali come
 naturali, li quali si refflettono ne l'occhio humano.

25

Disputa del poeta e pittore et che differentia è da poesia a
 pittura

Dice il poeta che la sua scientia è invenzione et
 misura e questo è il semplice corpo de poesia, inventione
 di materia e misura ne' versi, et che lui si veste poi di 5
 tutte le scientie. Al quale risponde il pittore, havere li
 medesimi obblighi nella scientia della pittura, cioè
 inventione et misura—inventione nella materia che lui
 debbe fingere, et misura nelle cose depinte aciò non sieno
 sproportionate. Ma che lui no si veste tali tre scientie, 10
 anzi che l'altre in gran parte si vestono della pittura,
 come l'astrologia, che nulla fa senza la prospettiva, la

5 natura. Per] ~ ^ per OR

6 carceri] carcera OR

7 le] li OR; le ED “i” altered to “e”

8 lascia] lacia OR; lascia ED “s” interlined above “ac”

10 mondo. E] ~ ^ e OR

12 vitta? O] ~ , o OR

13 loro? Et] ~ ^ et OR

15 l'occhio. La] ~ ^ la OR; uddire] udire ED first “d” deleted

16 ch'anno] ED interlined above: “è hanno”

25 4 misura e questo] misura questo OR; misura è questo ED “è” added at end of line

6 scientie. Al] scientie ^ al OR

8 misura—inventione] ~ ^ ~ OR

10 sproportionate. Ma] ~ ^ ma OR

works of nature. According to the view that the soul is content to remain in its human prison as long as the eyes present the soul with all the varied things of nature, whoever loses his eyes leaves his soul in a dark prison where every hope is lost of ever again seeing the sun, light of all the world. And how many are those who abhor most the darkness of the nights, even though they are so shortlived? What would they do if such darkness were to be their companions for life? Certainly there is no one who would not prefer to lose his senses of hearing and smell than to lose an eye. By consenting to the loss of hearing, all the sciences which terminate in words are lost; a man only does this in order not to lose the beauty of the world which consists of the surfaces of bodies, as these surfaces reflect the accidental as well as the natural in the human eye.¹⁰⁰

25. The Dispute of the Poet and the Painter, and What the Difference Is between Poetry and Painting

The poet says his science is invention and measure and this is the simple body¹⁰¹ of poetry, the invention of the material¹⁰² and the measure of the verses, which are then clothed by all the sciences. The painter responds that he has the same obligations in the science of painting, that is, invention and measure—invention of the material that he ought to feign, and measure in the things which are painted so that they are not disproportioned. Yet painting is not clothed by three sciences, rather, to a great extent the others are clothed by painting, since astrology does nothing with-

¹⁰⁰ Kemp/Walker translates: “with these visual effects, and actual forms as reflected in the human eye.” On Leonardo’s distinction between “accidental” and “natural,” see suggestions made in the Commentary.

¹⁰¹ “Semplice corpo” is apparently a term complementary to “corpo ombroso.” See n. 4. Kemp/Walker translates “main substance.”

¹⁰² Subject matter.

quale è principal membro d'essa pittura. Cioè l'astrologia
matematica, non dico della fallacce giudiciale, perdonemi
chi per mezzo de li sciochi ne vive. Dice 'l poeta, che 15
descrive una cosa, che ne rapresenta un' altra piena di
belle sentenze. Il pittore dice havere in arbitrio di fare
il medesimo, e in questa parte anch'egli è poeta et se'l
poeta dice di fare accendere gli homini ad amare è cosa
principale della spetie di tutti gli animali, Il pittore à 20
potenzia di fare il medesimo e tanto più che vi mette
inanzi a l'amante la propria effigie della cosa amata. Il
quale speso fa con quella bacciandola e parlando con quella,
quello che non farebbe con le medesime bellezze postole
inanzi dal scrittore. E tanto più supera l'ingegni de li 25
homini, ad amare et innamorarsi de pittura che no rapresenta
alcuna donna viva. Et gia interviene a me far una pittura
che rapresentava una cosa divina, la quale comperata
dall'amante di quella, volse levarne la rapresentatione de
tal Deità per poterla bacciare senza sospetto. Ma in fine 30
la conscientia vinse li sospiri e la libbidine, et fu forza
che lui ceta leva lei di casa. Hor va tu, poeta, descrivi
una bellezza senza rapresentatione di cosa viva e desta li
homini con quella a tali desiderij. Se tu dirai, io ti
descrivero l'inferno o 'l paradiso od altre delitie o 35
spaventij, el pittore ti supera perché ti metterà inanzi
cose che taccendo, diranno tali delitie a ti spaventaranno e
ti moveranno l'animo a fuggire, move più presto i sensi la
pittura che la poesia. E se tu dirai che con le parolle tu
levarai un populo in pianto o in riso, io ti dirò, che non 40
sei tu che move, e gli è l'oratore, et un scientia che non

13 pittura. Cioe] ~ ^ cioe OR

15 vive. Dice], dice OR; poeta] peta OR; poeta ED "o" interlined above "pe";
che] de OR

17 sentenze. Il] ~ ^ il OR

20 animali. Il] ~ ^ ~ OR

21 vi] ti ED "v" altered to "t"

22 amata. Il] ~ ^ il OR

25 scrittore. E] ~ , e' OR

27 viva. Et] ~ ^ et OR

30 sospetto. Ma] ~ ^ ma OR

31 conscientia] consientia OR

32 ceta] sela ED "c" altered to "s"; leva lei] leva se[?] ED "lei" altered to "se";
casa. Hor] ~ ^ hor OR

34 desiderij. Se] ~ ^ se OR

36 spaventij,] ~ ^ OR; ~

39 poesia. E] ~ ^ e' OR

out perspective, which is a principal part of painting. I am speaking of mathematical astrology and not about fallacious divinations, which is (pardon me for saying so) the means by which fools live. The poet says that, by describing one thing, he presents another full of beautiful judgments.¹⁰³ The painter says he has free will to do the same, and in this respect he is also a poet. And, if the poet says that he kindles love in men, this is the principal thing in all species of animals. The painter has the power to do the same, and much more because he puts the actual effigy of the thing loved in front of the lover. Often the lover kisses the effigy and speaks to it, which he would not do if the same beauties were put in front of him by the writer. [The painter] overpowers the *ingegni*¹⁰⁴ of men even more, for he makes them love and fall in love with a painting that does not represent any living woman. Once I happened to make a painting which represented something divine that was bought by someone who loved it, who wanted to remove the representation¹⁰⁵ of the deity so he would be able to kiss the painting without misgivings. But in the end his conscience rose above his sighs and his lust, and he was forced to remove it from his house. Now you poet, go describe a beauty without any representation of a living thing¹⁰⁶ and arouse men to such desires with it. If you would say, "I shall describe hell or paradise, or other delights or terrors," the painter will surpass you because he will place things before you which, although silent, will speak of such delights, or frighten you, or turn your mind to flight. [Painting] moves the senses more quickly than poetry. If you [the poet] would say that you will move people to tears or laughter with words, I will reply that it is not you who moves, but the orator and a science which is not poetry. Now the

¹⁰³ McMahon translates "sentences."

¹⁰⁴ See n. 72.

¹⁰⁵ I.e., its attributes.

¹⁰⁶ Kemp/Walker translates: "without basing your depiction on an actual person."

è poesia. Ma il pittore moverà a riso, ma non a pianto,
per ch'el pianto è maggior accidente che non è 'l riso.

Uno pittore fecce una figura che, chi la vedeva subito
sbadigliava e tanto replicava tale accidente quanto se 45
teneva li occhi alla pittura, la quale ancho a lei, era
finta sbadigliare. Altri hanno depinto atti libbidinosi et
tanto lussoriosi che hanno incitati li risguardatori di
quelle alla medesima festa, il che non farà la poesia.

Et se tu scriverai la figura d'alcuni dei, non sara 50
tale scrittura nella medesima veneratione che la iddea
dipinta perché a tale pittura sara fatto di continuo voti
et diverse orationi, et a quella concorrera varie
generationi de diverse provincie e per li mari orientali. Et
da tali si dimandarà soccorso a tal pittura, e non alla 55
scrittura.

26

Arguitione del poeta contra 'l pittore

Tu dici, o pittore, che'lla tua arte è adorata. Ma
non inputtare a te tal virtù, ma alla cosa di che tal
pittura è rappresentatrice. Qui 'l pittore risponde: o tu,
poeta, che ti fai anchora tu imitatore, perché non 5
rappresenti tu con le tue parole cose che le lettere tue,
contenitrici d'esse parolle, anchora loro sieno adorate? Ma
la natura ha più favorito il pittore ch'el poeta, e
meritamente l'opere del favorito debbono essere più
honorate che di quello che non è in favore. Adonque, 10
laudiamo quello che con le parolle satisfà a l'audito, e
quel che con la pittura satisfà al contento del vedere. Ma
tanto meno quel delle parole quanto e'lle sono accidentali e

42 poesia. Ma] ~ , ma OR

44 figura] Ludwig amends to "pittura"

47 sbadigliare. Altri] ~ ^ altri OR

48 lussoriosi] OR final "i" altered from "o"; incitati] inciitati OR

53 concorrerà] concorreranno ED "no" interlined after "a"

54 orientali. Et] ~ ^ et OR

26 2 adorata. Ma] ~ , ma OR

4 rappresentatrice. Qui] rappresentatrice, qui OR second "a" altered from illegible letter; risponde: o] ~ . o OR

7 adorate?" Ma] ~ - ma OR

10 favore. Adonque] ~ ^ adonque OR

11 satisfà] satifa OR; satisfà ED "s" interlined above "if"; satisfà] satifa OR;
satisfà ED "s" interlined above "f"

12 vedere. Ma] ~ ^ ma OR

painter will [be] moved to laughter, but not to tears, because it is only a laugh what a major accident this sorry state of things is.¹⁰⁷

One painter made such a figure that whoever saw it immediately yawned and kept repeating this accident¹⁰⁸ as long as his eyes were on the painting which, like him, feigned someone yawning. Others have painted libidinous acts, and so much lewdness that [the paintings] have incited spectators to the same celebration. This, poetry will not do.

And if you will figure any gods in writing,¹⁰⁹ such writings will not be held in the same veneration as the painted deity since offerings and various prayers will continuously be made to the painting, and many generations from different provinces and over the eastern seas will assemble there. And they will demand succor from this painting, but not from the writing.

26. A Poet's Argumentation against a Painter

"O painter, you say your art is adored, but do not impute the virtue to yourself, but to the thing which the painting represents." The painter responds, "O poet, you who are also an imitator in what you make, why do you not represent things with your words so that the letters of which your words consist will be adored, too?" Yet nature favors the painter more than the poet, and the works of the favorite deserve more honor than works which are not in favor. So let us praise what satisfies hearing with words, and what delights sight with painting. But poetry deserves less praise as far as words

¹⁰⁷ Richter translates: "but the poet will move you to laughter and not to tears because weeping implies a more violent agitation than laughter." McMahon translates: "the painter will move to laughter but not to tears, for tears are a greater disturbance of the emotions than laughter." Neither translation makes much sense, but the (more logical, punning) variant suggested here assumes a textual corruption ("si movera" instead of "movera"). See Commentary.

¹⁰⁸ See n. 63. Kemp/Walker translates: "continued to repeat this behavior."

¹⁰⁹ Kemp/Walker translates: "write about the image of a god."

create da minor autore che l'opere di natura, di che 'l
pittore è imitatore, la qual natura è terminante dentro 15
alle figure delle lor superfitie.

27

Risposta del Re Matia ad un poeta che garreggiava con un
pittore

Portando il dì del nattale del Re Matia un poeta
un'opera fattagli in laude del giorno ch'esso re era a 5
benefitio del mondo, et un pittore gli presentò un
ritratto della sua inamorata, subito il Re rinchiuse il
libbro del poeta, et voltossi alla pittura, et a quella
fermo la vista con grande admiratione. Allora il poeta forte
isdeggiato disse: O Re, leggi. Leggi, e sentirai cosa di
maggior sustantia che una mutta pittura. Allora il Re, 10
sentendosi riprender del risguardare cose mutte, disse: O
poeta, tacci tu che no sai ciò che ti dica, questa pittura
serve a miglior senso che la tua, la quale è da orbi.
Dammi cosa ch'io la possa veddere e toccare et non che sola 15
mente la possa uddire. E no biasmare la mia ellettione de
l'havermi io messa la tua opera sotto 'l gomito e questa del
pittore tengo con due le mani, dandolla alli miei occhi.
Perché le mani da lor medessime hanno tolto a servire a
più degno senso, che no è l'udire. Ed io per me giudico 20
che tale proportionie sia dalla scientia del pittore a quella
del poeta qual'è dalli suoi sensi de quali queste si fanno
obbietti. Non sai tu che la nostra anima è composta d'ar-
monia ed armonia non s'ingenera se non in istanti ne quali
le proportionalita delli obbietti si fan vedere o udire?
Non vedi che nella tua scientia non è proportionalita 25

- 27 8 admiratione. Allora] dd miratione ^ a'loro OR; admminatione ^ allhora ED
"ad" interlined above deleted "dd" and abbreviation sign added above "m" and
"lh" interlined above "o"
9 disse: O] ~, ~ OR leggi. Leggi] ~ ^ leggi OR
10 pittura. Allora] ~, allora OR
11 disse: O] ~, o OR
13 orbi. Dammi] ~, dammi OR
15 uddire. E] ~ ^ e' OR
16 opera] ppera OR opera ED "opera" interlined above deleted "pper" OR
17 occhi. Perché] ~ ^ perche OR
19 degno] degnii OR; degno ED "ii" altered to "o"; l'udire. Ed] ~, ed OR
22 obbietti. Non] ~ ^ non OR
24 udire? Non] ~ ^ non OR

are accidentals¹¹⁰ and created by lesser authors than the works of nature, of which the painter is the imitator: this nature is enclosed within figures by their surfaces.¹¹¹

27. The Reply of King Matthias to a Poet Who Challenged a Painter

On the birthday of King Matthias a poet brought him a work which he had made in praise of the day that the world was favored with the king,¹¹² and a painter presented him with a portrait of his beloved. The king immediately closed the poet's book and with great admiration turned to the painting, which arrested his vision. Then the poet said, very indignantly, "O King, read! Read, and you will know things of greater substance than a mute painting." Then the king, hearing himself reproached for looking at mute things, said, "Silence, O poet. You do not know what you are saying, this painting serves a better sense than your [work], which is for the blind. Give me something I can see and touch and not only hear, and do not blame my choice to put your work under my elbow while I hold the work of the painter with both hands to place it before my eyes. For, on their own, my hands have taken your work away in order to serve the more honorable sense, and that is not [the sense of] hearing. I judge for myself that the proportion between the science of the painter and that of the poet is just like the one between their senses and the objects made for those senses. Do you not know that our soul is composed of harmony, and that harmony is only generated in those instants when the proportionality of objects is seen or heard? Do you not see that in your science

¹¹⁰ Richter and McMahon translate "accidental." On the difference between words and works, see Commentary.

¹¹¹ Richter translates "enclosed within the surfaces of their shapes." McMahon does not translate the phrase.

¹¹² Richter translates: "a poet brought him a work composed for him in praise of the event which he said was for the benefit of the world." Kemp/Walker translates: "a poet brought him a work which he had made to commemorate the day that the world was gifted to the King."

creata in istante anzi l'una parte nasce dall'altra
 successivamente, e non nase la succedente se l'antecedente
 non more? Per questo giudico la tua inventione essere assai
 inferiore a quella del pittore solo perché da quella non
 componesi proportionalità armonica. Essa non contenta la 30
 mente de l'auditore, o veditore, come fa la proportionalità
 delle bellissime membra, componitrici delle divine bellezze
 di questo viso che m'è dinanzi. Le quali, in un medesimo
 tempo tutte insieme gionte, mi dano tanto piacere con la
 loro divina proportion che null'altra cosa giudico essere 35
 sopra la terra fatta da l'homo che dar la possa magiore.

Non è sì 'nsensato giuditio che, s'egli è preposto
 qual è più da elleggiere o stare in perpetue tenebbre o
 voler perdere l'audito, che subito non dica volere più
 tosto perdere l'udita insieme con l'odorato, prima che 40
 restar ciecho. Perché chi perde il vedere perde la
 bellezza del mondo con tutte le forme delle cose create, e
 il sordo sol perde il suono fatto dal moto de l'aria
 percosa, ch'è minima cosa nel mondo.

Tu, che dici la scientia essere tanto più nobile 45
 quanto essa s'astende in più degno subbietto, e per questo
 più vale una falsa imaginatione della essentia d'Iddio che
 una imaginatione d'una cosa men degna, e per questo diremo
 la pittura, la qual sol s'astende ne l'opere d'Iddio, esser
 più degna che'lla poesia, che solo s'astende in buggiadre 50
 finzioni de l'opere humane.

Con debbita lamentatione si dole la pittura per esser
 lei scacciata del numero delle arti liberali. Con ciò sia
 che essa sia vera figliola della natura et operata da più
 degno senso. Onde à ttorto, o scrittori, l'avete lasciata 55
 fuori del numero delle dett' arti liberali? Con ciò sia che
 questa non ch'elle opere di natura ma ad infinite attende
 che la natura mai le creò.

28 more? Per] ~ ^ per OR

30 armonica. Essa] ~ ^ essa OR

33 dinanzi. Le] ~ ^ le OR

34 insieme] preceded by deleted "che" OR

41 ciecho. Perché] ~ ^ perche OR

48 degna] OR "d" altered from "or" to "g"; gegna ED "d" or "g" altered to "g"

53 liberali. Con ciò sia] ~ ^ conciosa OR; senso. Onde] ~ ^ senso OR; Onde à
 ttorto] Ludwig renders "Ond'è attorto"

55 senso. Onde] ~ ^ onde OR

56 liberali? Con ciò sia] ~ ^ conciosa OR

proportionality is not created in an instant, rather one part is born successively after another, and the successor is not born if the antecedent does not die. Therefore, I judge your invention to be greatly inferior to the painter's solely for the reason that it does not compose any harmonic proportionality. [Poetry] does not content the mind of the listener, or viewer, as does the proportionality of very beautiful members, components of divine beauties in this face in front of me. These [components], which are joined together at one and the same time, give me so much pleasure in their divine proportions that I judge that nothing else on earth made by man could give me greater pleasure."

There is no judgment so insensate that, given the proposition of whether it is more elect to remain in perpetual darkness or to lose one's sense of hearing, does not immediately say that he would lose his hearing, together with his sense of smell, rather than remain blind. For whoever loses his sight loses the beauty of the world together with all the forms of created things, whereas the deaf person loses only sounds made by the motion of the percussed air, which is the least thing in the world.

You who say that science is more noble as it extends to a more worthy subject, by this [reasoning], a false imagination of the essence of God is worth more than the [true] imagination¹¹³ of a less worthy thing. Accordingly, we would say that painting, which alone extends to the works of God, is more honorable than poetry, which only extends to lying fictions about the works of man.¹¹⁴

With justified lamentation, painting complains of being driven out of the number of the liberal arts. For painting is a true daughter of nature; and performed by the most worthy sense. O writers, for what twisted reason have you left her outside the number of the liberal arts? For painting extends not only to the works of nature but to infinite [others] which wait for nature ever to create them.

¹¹³ Richter translates "representation."

¹¹⁴ Richter translates "deeds of men;" McMahon translates "human actions."

28

Conchlussione infra 'l poeta et il pittore

Poi che noi habbiamo concluso, la poesia essere in
 sommo grado di comprensione alli ciechi, et che la pittura
 fa il medesimo alli sordi, noi diremo tanto di più valere
 la pittura che la poesia quanto la pittura serve a miglior
 senso et più nobile che'lla poesia. La qual nobilita è 5
 provata essere tripla alla nobilita di tre altri sensi,
 perché è stato elletto di volere più presto perdere
 l'audio, et odorato, e tatto ch'el senso del vedere.
 Perché chi perde il vedere perde la veduta e bellezza de 10
 l'universo et resta a similitudine d'un che sia chiuso in
 vitta in una sepoltura nella habbia moto et vitta.
 Hor non vedi tu che l'occhio abbraccia la bellezza de
 tutt'il mondo? Lui è capo della astrologia, lui fa la
 cosmografia, lui tutte le humane arti consiglia e coreggie, 15
 lui move l'homo a diverse parti del mondo. Questo è
 prencipe delle matematiche, le sue scientie sono certissime.
 Questo ha misurato l'altezze et grandezze delle stelle,
 questo ha trovato gli elementi e loro siti, questo ha fatto
 predire le cose future mediante il corso delle stelle, 20
 questo l'architettura e prospettiva, questo la divina
 pittura à generata. O, eccellentissimo sopra tutte l'altre
 cose create da Dio, quali laudi fien quelle che'sprimere
 possino la tua nobilita? Quali populi, quale lingue
 saranno quelle che possino a pieno descrivere la tua vera 25
 operatione? Questo è finestra de l'human corpo, per la
 quale la sua via speccula e fruisse la bellezza del mondo.
 Per questo l'anima si contenta della humana carcere, et
 senza questo essa humana carcere è suo tormento. Et per

-
- 28 6 poesia. La] ~ ^ la OR
 8 più presto] Ludwig renders "piutosto"
 9 vedere. Perche] ~ ^ perche OR
 12 vitta. Hor] ~ ^ li or OR; vita ^ hor ED first "t" deleted, "li" altered to "h"
 14 mondo? Lui] ~ ^ lui OR
 16 mondo. Questo] ~ ^ questo OR
 19 ha] OR "h" altered from "a"
 22 generata. O,] ~, o, OR
 24 nobilità? Quali] nobilita ^ quali OR; quelle] OR second "e" altered from
 "a"; possino a pieno] Ludwig amends to "appieno posete"
 26 operatione? Questo] ~ ^ questo OR
 27 mondo. Per] ~ ^ per OR
 29 tormento. Et] ~ ^ et OR

28. Conclusion[s] Derived from the Poet and the Painter

Since we have concluded that poetry is comprehensible in the highest degree to the blind, and that painting does the same for the deaf, we will say that the value of painting is as much greater than the value of poetry as the sense which painting serves is better and more noble than that of poetry. The nobility of the sense which painting serves is proven to be triple to the nobility of the other three senses, since it was decided that losing the senses of hearing, smell, and touch are preferable to losing the sense of sight. For whoever loses his sight loses both the view and the beauty of the universe and is similar to someone who has been buried alive in a sepulcher where he can move and survive. Do you not see that the eye embraces the beauty of the whole world? It is the head of astrology,¹¹⁵ it practices cosmography, it counsels and corrects all human arts, it moves man to different parts of the world. [The eye] is the prince of mathematics; its sciences are certain. [The eye] has measured the heights and sizes of the stars, it has found the elements and their locations, it has made things be predicted in the future from the course of the stars. It has generated architecture, perspective, and divine painting. O, most excellent above all other things created by God, what praises can express your nobility? What peoples, what tongues will there be that could fully describe your true operation? The eye is the window of the human body, the way it speculates and enjoys the beauty of the world. On account of this the soul is content in its human prison, and without this the human prison is its torment. Thus human industry has discovered

¹¹⁵ Mathematical astrology, i.e., astronomy.

questo la industria humana ha trovato il focho, mediante il 30
 quale l'occhio riaguista quello che prima li tolsero le
 tenebre. Questo a ornato la natura con l'agricoltura e
 dilettevoli giardini. Ma, che bissogna ch'io me astenda in
 sì alto e longho discorso? Quale è quella cosa che per 35
 lui non si faccia? Lui move li huomini da l'Oriente a
 l'Occidente, questo ha trovato la navigatione et in questo
 supera la natura, perché li semplici naturali son finiti et
 l'opere che l'occhio commanda alle mani sono infinite, come
 dimostra 'l pittore nelle finctioni d'infinite forme
 d'animali ed herbe e piante et siti. 40

Fine in quanto di poesia e pittura

29

Come la Musica si de' chiamare sorella et minore della
 pittura

La Musica non è da essere chiamata altro che sorella
 della pittura con ciò sia ch'essa è subbietto dell'audito, 5
 secondo senso a l'occhio, e compone armonia con le congion-
 tioni delle sue parti proportionali operate nel medesimo
 tempo. Constrette a nascere e morire in uno o più tempi ar-
 monici li quali tempi circondano la proportionalità de mem-
 bri, di che tale armonia si compone non altrimenti che si 10
 faccia la linea circonferentiale le membra di che si genera
 la bellezza humana. Ma la pittura eccelle et signoreggia la
 Musica, perch' essa non move imediate dopo la sua creatione,
 come fa la sventurata musica, anzi resta in essere, e ti si
 dimostra in vitta quel che infatto è una sola superfitie. O
 maravigliosa scientia, tu risservi in vitta le caduche bel- 15
 lezze de mortali! Le quali hanno più permanentia che l'o-
 pere de natura, le quali al continuo sonno variate dal tem-
 po, che'lle conduce alla debita vecchiezza. Et tale scientia

- 32 tenebre. Questo] ~ ^ questo OR
 33 giardini. Ma] ~ ^ ma OR
 34 discorso? Quale] ~ ^ quale OR
 35 faccia? Lui] ~ ^ lui OR
 29 4 ch'essa] OR second "s" altered from "a"
 7 tempo. Constrette] ~ ^ constrette OR
 11 humana. Ma] ~, ma OR
 14 superfitie. O] ~ ^ O' OR
 16 mortali! Le] ~ ^ le OR
 18 vecchiezza. Et] ~ ^ et OR

fire, by means of which the eye has regained that place which darkness formerly took away. Thus nature has been embellished by agriculture and delightful gardens. Yet, is it necessary to extend myself in such an exalted and long discourse? What is there that cannot be done with [the eye]? It moves men from East to West; it has discovered navigation and so surpasses nature. For things that are simply natural are finite, and the works which the eye commands of the hands are infinite, as the painter demonstrates in his fictions of infinite forms of animals and grasses, of plants and places.

The End with Regard to Poetry and Painting

29. How Music Ought to Be Called the Sister, and Junior¹¹⁶ to Painting

Music is to be regarded none other than the sister of painting since it is subjected to hearing, a sense second to the eye, and since it composes harmony from the conjunction of its proportional parts operating at the same time. [These parts] are constrained to arise and to die in one or more harmonic tempos¹¹⁷ which surround a proportionality by its members; such a harmony is composed not differently from the circumferential line which generates human beauty by its [respective] members. Yet painting excels and rules over¹¹⁸ music, because it does not immediately die after its creation the way unfortunate music does. To the contrary, painting stays in existence, and will show you as being alive what is, in fact, on a single surface. O marvelous science, you keep alive the transient beauties of mortals! [These beauties] are more permanent than the works of nature, which are continuously changed by time, which

¹¹⁶ “Minore” (translated here as “junior”) is a pun because it means both “lesser” and “younger sister.”

¹¹⁷ Kemp/Walker translates “intervals.” Richter, McMahon, and Winternitz translate “rhythm.” However, “tempo” is a rate of movement, while “rhythm,” a regulated pattern of long and short notes, is too limiting for the present context. Marinoni, ed., *Ms. M*, cites fol. 45r, ca. 1497, where Leonardo proposes to divide the movement of time “into degrees in the manner in which it is done among musicians.” According to Marinoni’s analysis of “harmonic tempo,” Leonardo, “not having at his disposal chronometers suitable to the task at hand, learned to measure time by beating it out like a musician in regular intervals.” Leonardo divided spatial and temporal intervals alike into continuous proportions: see Commentary.

¹¹⁸ McMahon translates “lords it over.”

ha tale proportione con la divina natura quale ànno le sue
opere con l'opere d'essa natura, et per questo è adorata. 20

30

Parla il pittore col musico

Dice il musico, che la sua scientia è da essere equi-
parata a quella del pittore perché essa compone un corpo di
molte membra del quale lo speculatore contempla tutta la sua
gratia in tanti tempi armonici quanti sono li tempi nelli 5
quali essa nasce et muore. Et con quelli tempi, transtulla
con gratia l'anima, che risiede nel corpo del suo contem-
plante. Ma il pittore risponde et dice, ch'el corpo composto
delle humane membra non dà di sè piacere a tempi armonici
nelli quali essa bellezza abbia a variarsi dando figurazione 10
ad un altro, ne che in essi tempi abbia a nascere e morire.
Ma la fa permanente per moltissimi anni, et è di tanta ec-
cellenza che'lla risserva in vitta quella armonia delle
proportionate membra, le quali natura con tutte sue forze
conservare non potrebbe. Quante pitture ha conservato il si- 15
mulacro d'una divina bellezza ch'el tempo o morte in breve,
ha distrutto il suo natural essemplio! Et è restata più
degnà l'opera del pittore che della natura sua maestra.

31

Il pittore dà i gradi delle cose opposte all'occhio, come
'l musico dà delle voci opposte all'orecchio

Benché le cose opposte all'occhio si tocchino l'una et
l'altra di mano in mano, nondimeno farò la mia reghola di

- 30 1 Parla il pittore col musico] Parla il musico, col Pittore ED "pittore col" deleted
preceding "musico" and "col Pittore" added following "musico"
2 scientia] seientia OR; scientia ED first "e" altered to "c"
5 quanti] OR "ti" altered from "do"
6 muore. Et] ~ ^ et OR
8 contemplante. Ma] ~, ma OR
11 morire. Ma] ~ ^ ma OR
15 potrebbe. Quante] ~, quante OR
17 essemplio! Et] ~, et OR
18 natura] nauura OR; natura ED first "u" altered to "t"
31 1 dà] OR this word is added by ED: "da" interlined preceding "delle"

Ms. A, f. 103r

1 pittore dà] Io do; 'l musico dà] chome il musicho

duly leads to old age. This science is in the same proportion to divine nature as are its works to the works of nature, and on this account it is revered.

30. A Musician Speaks with a Painter

The musician says that his science is upon a par with the science of the painter since music composes a body from many members for the speculator to contemplate all its grace in as many harmonic tempos¹¹⁹ as there are tempos in which [music] is born and dies. By means of these tempos, [music] gracefully delights the soul which resides in the body of the contemplator. Now the painter responds by saying that it is not the body composed of human members which pleases of itself in harmonic tempos, wherein beauty has to be varied in order for one figuration to lead to another; nor is it that beauty has to be born and to pass away in these tempos.¹²⁰ Rather [the painter] makes beauty permanent for many, many years, and it is of such excellence that the harmony of its proportionate members is kept alive, which nature with all her powers¹²¹ could not conserve. How many paintings have preserved the simulacrum of a divine beauty where time or death, in short, has destroyed nature's model! The work of the painter has lasted more nobly than that of nature, his mistress.

31. The Painter Presents Things Which Are Placed Opposite the Eye, According to Degrees,¹²² as Does the Musician with Tones¹²³ Placed Opposite the Ear¹²⁴

Although things placed in front of the eye touch one another bit by bit,¹²⁵ nevertheless, I shall make my rule of twenty by twenty

¹¹⁹ See n. 117.

¹²⁰ Richter translates: "nor is [beauty] composed in rhythms which are constantly required to be born and die."

¹²¹ Richter translates "force"; McMahon translates "strength."

¹²² Richter translates "measures the distances."

¹²³ "Voce" refers to "tone," a sound of distinct pitch.

¹²⁴ The first paragraph is excerpted from *Ms. A*, fol. 103r. Variations are given in the Critical Apparatus. See discussion in the Commentary.

¹²⁵ Richter translates "as they recede"; McMahon translates "at arm's length"; Kemp/Walker translates "as if hand in hand."

XX in XX braccia, com' ha fatto il musico infra le voci, 5
 che benché la sia unita et appiccha insieme, nondimeno à
 posti gradi de voce in voce, domandando quella prima,
 seconda, terza, quarta, e quinta; et così, di grado in
 grado, à posto nomi alla varietà d'alzare et bassare la
 voce. 10

Se tu, o musico, dirai che la pittura è meccanica per
 essere operata con l'esserzitie delle mani, et la musica è
 operata con la bocca, che è orghano humano. Ma non pel
 conto del senso del gusto come la mano senso del tatto.
 Meno degne sonno anchora le parolle che fatti. Ma, tu 15
 scrittore delle scientie, non coppij tu con mano, scrivendo
 ciò che sta nella mente come fa il pittore? Et se tu
 diccessi la musica esser composta di proportioni, o io con
 questo medesimo seguito la pittura, come me vedrai.

Dopo questa viene la scultura, arte dignissima ma non 20
 di tanta eccellentia d'ingegno operata con ciò sia che in
 i' dui casi principali, sia difficilissima, co' quali il
 pittor proccede nella sua questa è aiutata dalla natura.
 Cioè prospettiva, ombra e lumi. Questa anchora non è
 imitatrice de' colori, per li quali el pittore s'afaticha a 25
 trovare che'lle ombre sieno compagne de' lumi.

Quella cosa è più degna che satisfà a miglior senso.
 Adonque, la pittura, satisfacitrice al senso del vedere, è
 più nobile che'lla musica, che solo satisfà all'udito.

Quella cosa è più nobile che ha più eternità. A- 30
 donque, la musica che si va consumando mentre che'lla nasce,
 è men degna che la pittura, che con vetri si fa eterna.

Quella cosa che contiene in sè più universalità et
 varietà di cose, quella sia detta di più eccellentia.

7 posti] pochi OR (see Ms A apparatus)

8 quinta; et] quin.a ^ ~ OR

10 voce] vocce OR

13 humano. Ma] ~ ^ ma OR

15 fatti. Ma] ~ ^ ma OR

17 pittore? Et] ~ ^ et OR

18 diccessi] discessi OR; dicessi ED first "s" deleted

23 natura. Cioè] ~ ^ cio è OR

24 lumi. Questa] ~ ^ questa OR

25 senso. Adonque] ~ ^ adonque OR

30 eternità. Adonque] ~ ^ adonque OR

34 eccellentia. Adonque] ~, adonque OR

braccia,¹²⁶ just as the musician has done with tones.¹²⁷ Although [tones] may be united and joined together, nevertheless he has put positions¹²⁸ between tone and tone, naming them first, second, third, fourth, and fifth; and so, degree by degree, he has given names to the varieties of raising and lowering tone.¹²⁹

O musician, if you would say that painting is mechanical for being performed by manual exercise, music is performed with the mouth, which is [also] a human organ. Yet it is not working for the sense of taste in this case, just as the hands are not working for the sense of touch. Yet words are less noble than deeds. Now you, writer on the the sciences, do you not copy by hand while writing what is in the mind, as does the painter? If you, or I, would say that music is composed of proportion, the same follows for painting as you will see.¹³⁰

After this comes sculpture, a most deserving art but not of such excellent *ingegno*,¹³¹ because sculpture is helped by nature in two principal things, and the most difficult, by which the painter proceeds in working his art. These are perspective, and shadow and lights. The sculptor is also not an imitator of colors, for which the painter takes pains to discover how the shadows are accompanied by lights.

That thing is more worthy which satisfies the better sense. Therefore painting, which satisfies the sense of sight, is more noble than music, which only satisfies hearing.

That thing is more noble which is more eternal. Therefore music, which is consumed as it is born, is worth less than painting, which is made eternal with glazes.

That thing is said to be more excellent which contains more universality and variety of things within itself. Therefore painting is

¹²⁶ A unit of measurement. The Florentine *braccio* was slightly less than 23 inches. Richter translates: "I shall found my rule on a series of intervals measuring 20 *braccia* each." Kemp/Walker translates: "I shall nonetheless found my rule on the base of 20 × 20 *braccia*."

¹²⁷ "Voci" does not agree with the singular verb "sia" in the following clause, but the antecedent is clear from the context.

¹²⁸ "Pochi" is a corruption of "posti"; see Critical Apparatus, citing the original in *Ms. A*. Richter and McMahon, unaware of this error, translate "a few" and "short," respectively.

¹²⁹ Richter translates: "until names have been given to the various degrees of pitch proper to the human voice."

¹³⁰ Although the last paragraph of this chapter returns to the theme of proportion in painting, the discussion immediately following suggests a disjunction in the original text, or a pastiche of two fragments at this point. See Commentary.

¹³¹ See n. 72.

Adonque la pittura è da essere preposta a tutte l'operati- 35
oni perch'è contenitrice de tutte le forme che sonno e di
quelle che non sonno in natura; e più da essere magnificata
et essaltata che la musica, che solo attende alla voce.

Con questa si fa li simulacri alli dij d'intorno a
questa si fa il culto divino, il quale è ornato con la 40
musica a questa servente. Con questa si dà copia alli
amanti della causa de loro amori. Con questa si risserva le
bellezze, le quali il tempo et la natura fa fugitive. Con
questa noi risserviamo le similitudini degli huomini famosi.
Et se tu dicessi la musica s'eterna con lo scriverla, el 45
medesimo facciamo noi qui con le lettere.

Adonque, poi che tu ai messo la musica infra le arti
liberali, o tu vi metti questa, o tu ne levi quella. Et se
tu dicessi gli huomini vili l'adoperano, e così è guasta
la musica da chi non la sa . . . 50

Se tu dirai le scientie non meccaniche sonno le
mentali, io ti dirò che la pittura è mentale, et che'lla
sì come la musica et geometria considera le proportioni
delle quantità continue, et l'aritmetica delle discontinue,
questa considera tutte le quantita continue, e'lle qualita 55
delle proportioni d'ombre e lumi, e distantie nella sua
prospettiva.

32

Conchlussione del poeta, pittore et musico

Tal differentia è in quanto alla figuratione delle cose
corporee dal pittore e poeta quanto dà lli corpi smembrati
a li uniti, perché il poeta nel descrivere la bellezza o
brutezza a di qualonche corpo, te lo dimostra a membro a 5
membro et in diversi tempi, et il pittore tel fa vedere
tutto in un tempo. E'l poeta non pò porre con le parole la

41 servente. Con] ~ ^ con OR

42 amori. Con] ~ ^ con OR

43 fugitive. Con] fugitive ^ con OR

44 famosi. Et] ~ ^ et OR

47 ài] hai ED "h" interlined preceding "a"; le' OR "l" altered from [?] "t"

48 quella, Et] ~ ^ et OR

49 l'adoperano] la d'operano OR

50 sa . . .] OR followed by: "mancavi per quel ch'io veggio."*

55 qualità] qualia OR; qualità ED "t" inserted after "i"

32 7 tempo. E'l] ~, el OR

placed before all [other] operations because all forms which are and which are not in nature are contained in it. It is to be magnified¹³² and exalted more than music, which attends to tone alone.

Through [painting],¹³³ divine worship is performed around the simulacra of gods, and music serves [painting] by ornamenting the worship. Through [painting], lovers receive copies of the cause of their loves. Through [painting] we preserve beauties which time and nature make fleeting. Through [painting], we preserve the similitudes of famous men. If you would say that music lasts forever by being written down, we do the same here with letters.

Therefore, since you have put music among the liberal arts, either you should put painting there or else take music away. Or, if you would say that debased men make use of painting, music is also spoiled when someone does not understand it. [...] you are missing something, as I see.¹³⁴

If you would say that the sciences are not mechanical but mental, I will tell you that painting is mental and that, just like music and geometry, it considers the proportions of continuous quantities [while] arithmetic considers discontinuous quantities, so painting considers all continuous quantities, the qualities of the proportions of shadow and lights, and distances through its [science of] perspective.

32. Conclusion[s] Derived from the Poet, Painter, and Musician

In the figuration of corporeal things, there is the same difference between the painter and the poet as [there is] between dismembered bodies and whole ones, because the poet, when he describes the beauty or ugliness of any body, demonstrates it to you member by member, and at different times, and the painter makes you see everything at once. The poet cannot put into words how the true

¹³² Praised.

¹³³ Although the reference to “painting” is clear from the context, “questa” has no antecedent here and in the following references in the same paragraph (bracketed in the translation). This suggests a disjunction in the original text. See also n. 130 and Commentary.

¹³⁴ McMahon, followed by Pedretti, reasonably suggest that the phrase following the lacuna is an editorial note by the scribe. Pedretti, *Libro A*, 1964, 99, and *Commentary*, 1: 12–13, further suggests that the scribe, Manus 1, is the editor Francesco Melzi, but the textual evidence here argues against such a hypothesis. If Melzi is also the amanuensis, whom does he address in this note? See the notes on editorial procedures in the Introduction to the *Parte Prima* text.

vera figura delle membra di che si compone un tutto com'è
 'l pittore, il quale tel pone in atti con quella verità 10
 ch'è possibile in natura. Et al poeta accade il medesimo
 com'à 'l musico che canta sol'un canto composto di quatro
 cantori et canta prima il canto, poi il tenore, e così
 seguita il contro alto, e poi il basso. E di costui non
 risulta la gratia della proportionalita armonica, la quale 15
 si rinchiude in tempi armonici. Et fa esso poeta a
 similitudine d'un bel volto il quale ti si mostra a membro a
 membro, che così facendo non rimaresti mai soddisfatto
 dalla sua bellezza. La quale solo consiste nella divina
 proportionalità delle predette membra insieme composte, le 20
 quale solo in un tempo compogghono essa divina armonia d'esso
 congiunto di membra, che spesso tolghono la liberta
 posseduta a chi vede. Et la musica ancora fa nel suo tempo
 armonico le suuavi melodie composte delle sue varie voci,
 delle quali il poeta è privato della loro discrezione
 armonica. Et benché la poesia entri per il senso 25
 dell'audito alla sedia del giuditio, sicome la musica, esso
 poeta non può descrivere l'armonia della musica perché non
 ha potestà in un per medesimo tempo di dire diverse cose,
 come la proportionalita armonica della pittura composta di
 diverse membra in un medesimo tempo, la dolcezza delle 30
 quali son giudicate in un medesimo tempo, così in comune
 come in particolare; in comune in quanto allo intento del
 composto, in particolare in quanto allo intento de' compo-
 nenti di che si compone esso tutto. E per questo il poeta
 resta in quanto alla figurazione delle cose corporee molto 35
 in dietro al pittore, et delle cose invisibili rimane in-
 dietro al musico. Ma se esso poeta toglie in prestito l'aiuto

8 vera] OR "a" interlined above "r"

10 natura. Et] ~ ^ et OR

13 basso. E] ~ ^ è OR

15 armonici. Et] ~ ^ et OR

17 membro] membo OR; membro ED "r" interlined above "o"

18 bellezza. La] ~ ^ la OR

20 armonia] OR preceded by the following deleted words: "proportionalità delle predette membra insieme composte le quali sol in un tempo comporr"; membra] membre ED "a" altered to "e"; vede. Et] ~ ^ et OR

22 vede. Et] ~ ^ et OR

25 armonica. Et] ~ ^ et OR

26 sedia] [?] "d" illegible OR; ED altered from illegible [?] "d"

28 un] OR "o" deleted from "uno"

29 proportionalità] proporzionalità OR; proportionalità ED "z" altered to "t"

32 particolare;] ~, OR

34 tutto. E] ~, é OR

figure composes one whole from its members as can the painter, who places them before you in action with the same truthfulness that is possible in nature. What happens to the poet is like the musician who sings a song composed for four singers by himself, and first sings the song for the soprano, then the tenor, and so on, followed by the contralto, and then the bass. The grace of harmonic proportionality, enclosed in harmonic tempos,¹³⁵ does not result from such singing. Similarly, when a poet makes a beautiful face, he shows it to you member by member, and in so doing, he never keeps you satisfied with its beauty.¹³⁶

For beauty consists only in the divine proportionality of the members composed together at one time. Such divine harmony in the conjunction of members often captivates the viewer.¹³⁷ While the harmonic tempo of music makes suave melodies composed of various voices, the poet is deprived of their harmonious descriptions.¹³⁸ Although poetry, like music, enters the seat of judgment through the sense of hearing, the poet cannot describe the harmony of music, because he does not have the power to say different things at one and the same time. Painting does compose a harmonic proportionality from different members simultaneously, the sweetness of which judged simultaneously, both in common and in particular: in common, according to the intent¹³⁹ of the composition; in particular, according to the intent of the components which compose the whole. According to this, the poet remains as far behind the painter in the figuration of corporeal things as he remains behind the musician in the figuration of invisible things. Yet if the poet borrows assistance from other sciences, he may as

¹³⁵ See n. 117.

¹³⁶ Kemp/Walker translates: "he never convinces you of its beauty."

¹³⁷ Richter translates: "which often so captivates the spectator that he loses his liberty." McMahon translates: "often enslaves him who sees it."

¹³⁸ See n. 65. Richter translates "discrimination"; McMahon translates "distinction."

¹³⁹ Richter translates "design." Kemp/Walker translates "the dictates."

dell'altre scientie, potrà comparire alle fere come li
 altri mercanti, portatori di diverse cose fatte da più
 inventori. Et fa questo il poeta quando s'inpresta l'altrui 40
 scientia, come del oratore e del filosofo, astrologho,
 cosmograffo et simili, le quali scienze sonno in tutto sepa-
 rate dal poeta. Adonque, questo è un sensale che gionghe
 insieme diverse persone a fare una conclusionne d'un mercato
 et, se tu vorai trovare il proprio ufficio del poeta, tu 45
 trovarai non esser altro che uno addunatore de cose rubate a
 diverse scienze, con le quali lui fa un composto buggiardo
 o, voi con più honesto dire, un composto finto. Et in
 questa tal finctione libera esso poeta s'è equiparato al
 pittore, ch'è la più debbole parte della pittura. 50

33

Quale Scientia è meccanica et quale non è meccanica

Dicono quella cognitione essere meccanica la quale è
 partorita dall'esperientia, e quella essere scientifica che
 nasce et finisce nella mente, a quella essere semimeccanica
 che nasce dalla scientia et finisce nelle operationi 5
 manuale. Ma a me pare che quelle scientie sieno vane et
 piene d'errori le quali non sonno nate dall'esperientia,
 madre d'ogni certezza, et che non terminano in nota
 esperientia, cioè che'lla loro origine, o mezzo o fine,
 non passa per nessun' de' cinque sensi. E se noi dubbittamo 10
 della certezza di ciascuna cosa che passa per li sensi,
 quanto maggiormente dobbiamo noi dubbitare delle cose
 ribelle ad essi sensi, come della sentia de Dio e dell'anima
 et simili, per le quali sempre si disputa e contende, et

37 musico. Ma] ~, ma OR preceded by deleted "pit"; se] OR "s" altered from
 "c,"

40 inventori. Et] ~, et OR

43 poeta. Adonque] ~, adonque OR

46 addunatore] OR preceded by deleted "ad[?]u"; Ludwig amends to
 "ragguna-

tore"; composto] OR preceded by deleted "corpo"

48 finto. Et] ~, et OR; finctione] fintione ED "c" deleted

33 4 nasce] OR "c" altered from "s"

5 nelle] OR "e" altered from [?] "ie"; operatione] operationi OR preceded by
 deleted "mente"; operatione ED second "i" altered to "e"

6 manuale. Ma] ~, ma OR

10 nessun'] nessun' OR; nessun ED "m" altered to "n"; sensi. E] ~ ^ e' OR;
 ~ ^ e' ED * the following passage is marked for deletion, beginning with "e se noi
 dubbittamo" and ending eleven lines later with "et non certezza rinata"

13 sentia] esentia ED "e" added preceding "s"

well present himself at a fair like other merchants who are porters of different things made by many inventors. The poet does the same when he borrows from other sciences, such as those of the orator, or the philosopher, the astrologer, the cosmographer, and the like, sciences which are altogether separate from the poet. So the poet is a middleman who collects different people to make a deal, and if you should want to discover the real duty of a poet you will discover that it is not other than that of one who assembles stolen things from various sciences in order to make a lying¹⁴⁰ composition or, with more honesty, let us call it a feigned composition. If the poet has put himself upon a par with the painter in his freedom to make such a fiction, this is the weakest part of painting.

33. Which Science Is Mechanical, and Which Is Not Mechanical

They say that cognition born from experience is mechanical, and what is born and ends in the mind is scientific, and whatever is born from science and ends in manual operations is semi-mechanical. Yet it appears to me that those sciences are vain and full of errors which are not born from experience, mother of every certainty, and which do not terminate in known experience, that is, their origin, or middle, or end does not pass through any of the five senses. [Now¹⁴¹ if you so greatly doubt the certainty of every thing that passes through the senses, with how much greater mind should we doubt things which rebel against the senses, like the knowledge of God, and the soul, and the like, things about which there are always disputes and contentions, and truly it so happens that

¹⁴⁰ Deceitful.

¹⁴¹ The passage bracketed in the translation, as noted in the Critical Apparatus, was marked for deletion by the sixteenth-century editor. McMahon, noting that part of the passage was deleted in the *ed. princeps* (Rome, 1817), suggests that the editor Manzi deleted a sensitive passage “in order not to incur the disapproval of the censor.” Manzi deleted the following: “come della sentia de dio, e dell’anima, et simili, per le quali sempre si.” However, the connection between the original sixteenth-century deletion and the first printed edition is unknown.

veramente accade che sempre dove manca la ragione supplisse 15
 le grida, la qual cosa non accade nelle cose certe. Diremo
 per questo che dove si grida, non è vera scientia perché
 la verità ha un sol termine, il quale essendo pubblicato,
 lettiggio resta in eterno distrutto et, s'esso lettiggio
 resurgie, la bugara e confusa scientia, et non certezza, 20
 rinata. Ma le vere scientie son quelle che la sperienza ha
 fatto penetrare per li sensi e posto silentio alle lingue de
 litiganti. E che non passe di sogno li suoi investigatori,
 ma sempre sopra li primi veri e noti principij procede
 successivamente e con vere sequentie infino al fine, come si 25
 dinota nelle prime matematiche, cioè numero e misura dette
 arismeticha e geometria, che trattano con soma verità della
 quantità discontinua e continua. Qui non si arguirà che
 due tre faccino più o men che sei, nè che un triangholo
 abbia li suoi angholi minori di duoi angholi retti, ma con 30
 eterno silentio resta distrutta ogni arguitione, e con pace
 sonno fruite dalli loro divotti, il che far non posson le
 buggiarde scientie mentali. Et se tu dirai tali scientie
 vere et note essere de spetie di meccaniche, impero che non
 si possono finire se no' manualmente, io diro il medesimo 35
 di tutte l'arti che passano per le mani delli scrittori, la
 quale è di spetie di disegno, membro della pittura. E
 l'astrologia et l'altre passano per le manuali operationi,
 ma prima sonno mentali com'è la pittura. La quale è prima
 nella mente del suo speculatore e non pò pervenire alla 40
 sua perfettione senza la manuale operatione. Della qual
 pittura li suoi scientifici et veri principij prima ponendo
 che cosa è corpo ombroso, et che cosa è ombra primitiva
 ed ombra derivativa, et che cose è lume, cioè tenebre,
 luce, colore, corpo, figura, sito, remotione, propinquità, 45

16 certe. Diremo] ~ ^ diremo OR

19 resta] retta OR; resta ED first "t" altered to "s"

21 rinata. Ma] ~ ^ ma OR; ~ ^ ma ED * where "rinata" is the last word
 deleted in passage beginning "è se noi dubbitiamo"; sperienza] OR preceded by
 deleted "vera"

23 litiganti. E] ~, è OR; passe] passee OR; passee ED first "s" deleted

25 successivamente] suscessivamente OR

28 continua. Qui] ~ ^ qui OR

31 distrutta] distrutte OR; distrutta ED "e" altered to "a"

33 mentali. Et] ~ ^ et OR

37 pittura. E] ~ ^ è OR

39 pittura. La] ~ ^ la OR

41 operatione. Della] ~ ^ della OR

45 colore] OR interlined above "luce, corpo"

where reason is lacking there is always shouting instead. This does not happen in the case of things which are certain. Thus we will say that where there is shouting, there is no true science, because truth can only end one way. When the truth is made public, the quarrels are eternally destroyed; but if the quarrels¹⁴² rise again, a lying and confused science, and not certainty, is reborn.]¹⁴³ Now the true sciences are those in which experience has penetrated the senses and silenced the tongues of the adversaries. Experience does not feed its investigators on dreams, but always proceeds on the basis of first truths and known principles, successively and in true sequence¹⁴⁴ towards the end, as it is noted in the first mathematics, that is, number and measure, called arithmetic and geometry, which treat discontinuous and continuous quantities with the utmost truth. Here no one will argue whether two threes make more or less than six, nor whether the angles of a triangle are less than two right angles. Every argument is eternally silenced in these sciences, and they are enjoyed by their devotees in peace, which the lying mental sciences cannot do.¹⁴⁵ If you would say that these true and noted sciences are of the species of mechanics, for they can be finished only manually, I will say the same of all the arts which pass through the hands of writers, a species of drawing, which is part of painting. Astrology and other [sciences] pass through manual operations but begin with mental operations, as does painting.¹⁴⁶ Painting begins in the mind of the speculator, but it cannot come to perfection without manual operation. The first operation of painting is to put down its scientific and true principles, which are: what is the umbrageous body,¹⁴⁷ what are primitive and derived shadow, and what is light,¹⁴⁸ that is, darkness, light, color, body, figure, position, distance, nearness, motion, and rest.

¹⁴² Richter and McMahon translate "controversy."

¹⁴³ The bracket marks the end of the passage deleted by the sixteenth-century editor. See n. 141.

¹⁴⁴ Richter translates "step by step"; McMahon translates "in orderly fashion."

¹⁴⁵ Kemp/Walker translates: "which is not possible with delusory sciences of a wholly cerebral kind."

¹⁴⁶ See n. 98.

¹⁴⁷ See n. 4. "Primitive" (alternately "primary"), and "derived" shadow correspond to gradations of shadow on an opaque body, and to cast shadow, respectively. Leonardo used these optical terms as early as *Ms. C*, ca. 1490: see further, Pedretti, *Commentary*, I: 153–154, 163–179.

¹⁴⁸ Leonardo distinguished between two kinds of light: "lume" here, and "luce" as the opposite of "tenebre" in the following list.

moto et quiete. Le quali solo con la mente si comprendono senza opera manuale, e questa sia la scientia della pittura, che resta nella mente de suoi contemplanti, della quale nasce poi l'operatione assai più degna della predetta contemplatione o scientia.

50

34

Perché la pittura non è connumerata nelle scientie

Perché gli scrittori non hanno aauta notitia della scientia della pittura, non hanno posuto descriverne li gradi e parti di quella. E lei medesima non si dimostra col suo fine nelle parole. Essa è restata mediante l'ignorantia indietro alle predette scientie, non mancando per questo di sua divinita, et veramente non senza caggione, non l'hanno nobilitata perché per sè medesima si nobilita senza l'aiutto del'altrui lingue, non altrimenti che si facciano l'eccellenti opere di natura. Et se li pittori non hanno di lei descritto et ridottola in scientia, non è colpa della pittura, e'lla non è per questo meno nobile. Possia che pochi pittori fanno professione di lettere perché la lor vitta non basta ad intendere quella. Per questo haremo noi a dire che'lle virtu dell'erbe, pietre et piante non sieno in essere perché gli huomini non l'abbino conossute. Certo no, ma diremo esse herbe restarsi in sé nobili senza lo haiutto delle lingue o lettere humane.

5

10

15

Fine

46 quiete. Le] ~ ^ le OR

49 più] puoi OR

34 2 aauta] OR "a" altered from "h"; ED "-a-" interlined above between "hanno" and "hauta"

4 quella. E] ~ ^ è OR

5 parole. Essa] ~, essa OR; l'ignorantia] l'ingorantia OR; l'Ignoranzia ED "in" deleted and "t" altered to "z"

9 senza] [?] g-za [illegible] OR; Seza[?] ED illegible original altered

10 natura. Et] ~ ^ et OR

13 nobile. Possia] ~ ^ possia OR

14 quella. Per] ~ ^ per OR

17 conossute. Certo] ~ ^ certo OR

These are comprehended only by the mind, without manual operations, and this is the science of painting which stays in the mind of its contemplators. The operation which can be born from the mind is much more worthy than the contemplation, or science, previously mentioned.

34. Why Painting Is Not Numbered Among the Sciences

Since writers had no knowledge of the science of painting,¹⁴⁹ they could not describe its degrees and parts. For the same [reason], the aim of painting cannot be demonstrated in words. Through ignorance painting remained behind the sciences previously mentioned, not because it lacked divinity, and yet truly not without cause either. [Writers] have not ennobled painting because painting possesses nobility in itself without the aid of other languages, not unlike the way the excellent works of nature do.¹⁵⁰ If painters have not described their art and reduced it to science, it is not the fault of painting, which is not less noble for that [reason]. It may be that few painters make a profession of letters because they do not need to understand that profession for their livelihood. So, too, [by this reasoning] we would have to say that the virtue¹⁵¹ of grasses, stones, and plants is certainly not due to man's knowledge of them. Certainly not, rather we would say that grasses are noble in themselves without the aid of human languages or letters.

¹⁴⁹ Kemp/Walter translates: "Because writers had no access to definitions of the science of painting."

¹⁵⁰ Kemp/Walker translates: "codified their art as science."

¹⁵¹ Richter and McMahon translate "properties." Kemp/Walker translates: "existence of the particular qualities."

35

Comincia della scultura, et se'lla è scientia, o no

La scultura non è scientia ma è arte meccanicissima perché genera sudore e fatica corporale al suo operatore. Et solo basta a tale artista le semplici misure de' membri e la natura delle movimenti e possati, e così in sè finisce dimostrando al occhio quel che quello è, et non dà di sè alcuna ammirazione al suo contemplante, come fa la pittura, che in una piana superfitie per forza de scientia mostra le grandissime compagne con li lontani orizzonti.

5

36

Differentia tra la pittura e lla scultura

Tra la pittura e la scultura non trovo altra differentia se non che lo scultore conduce le sue opere con maggior fatica di corpo ch'el pittore, ed il pittore conduce l'opere sue con maggior fatica di mente. Provassi così esser vero, con ciò sia che lo scultore nel fare la sua opera fa per forza di braccia et di percussione a consumare il marmo od altra pietra superchia che eccede la figura, che dentro a quella si rinchiude, con essercitio meccanicissimo accompagnato spesse volte da gran sudore composto di polvere e convertito in fangho, con la faccia impastata, e tutto infarinato di polvere di marmo che pare im fornaio, et coperto di minuto scaglie che pare li sia fioccato a dosso, et l'habbittatione inbrattata et piena di scaglie et di polvere di pietre. Il che tutt' al contrario avviene al pittore, parlando di pittori e scultori eccellenti, imperoché 'l pittore con grand aggio siede dinanzi alla sua opera ben vestito et move il levissimo penello con li vaghi colori, et ornato di vestimenti come a lui piace, et l'habbittazione sua piena di vaghe pitture, et pulita, et accompagnata spesse volte di musiche o lettori di varie et belle opere, la quale senza strepito di martelli od altri rumori misto sonno con gran piacer udite.

5

10

15

20

35 1 scultura] sculura OR

2 operatore. Et] ~ ^ et OR

36 5 mente. Provassi] ~, provassi OR

9 essercitio] esserritio OR; essercizio ED "r" altered to "c" and "t" altered to "z"

15 pietre. Il] ~, il OR

35. Beginning of Sculpture, and Whether It is Science

Sculpture is not science but a very mechanical art, because it generates sweat and bodily fatigue in the executant. The simple measurements of members and the nature of movements and poses alone are enough for such an artist, and so, sculpture ends by demonstrating to the eye only what is what and does not lend itself to admiration by contemplation, as painting does. Painting, by the power of science, demonstrates the grandest countrysides with distant horizons on one flat surface.

36. The Difference between Painting and Sculpture

The only difference I find between painting and sculpture is that the sculptor conducts his work with greater bodily fatigue and the painter conducts his work with greater mental fatigue. You can prove that this is true because when the sculptor makes his work he consumes the marble and other stone covering in excess of the figure enclosed within by effort of his arm and by percussion,¹⁵² which is a highly mechanical exercise, often accompanied by great amounts of sweat composed of dust and converted into mud. With his face caked and all floured with marble dust, he looks like a baker, and covered with minute flakes that look as though it has snowed on his back, and his house is filthy and full of chips and stone dust. Just the opposite happens to the painter (speaking of excellent sculptors and painters), because the painter sits in front of his work at great ease, well-dressed, and wielding the lightest brush with charming colors. His clothing is ornamented according to his pleasure, and his house is filled with charming paintings, and clean, and he is often accompanied by music or readers of varied and beautiful works that are heard with great pleasure without the uproar compounded of hammers and other noises.

¹⁵² Richter translates: “strokes of the hammer.”

Anchora lo scultore nel condurre al fine le sue opere
 à da fare per ciascuna figura tonda molti dintorni acciò 25
 che è di tal figura ne rissulti gratia per tutti gli
 aspetti. Et questi tali dintorni non son fatti se non dalla
 convenientia del alto e basso. Il quale non lo può porre
 con verita se non si tira in parte che'lla veda in profilo,
 cioè che li termini delle concavita e rilevi sien veduti 30
 avere confini con l'aria che li tocca. Ma, in vero questo
 non aggiongie fatica all'artefice, considerando che lui,
 sicome 'l pittore, ha vera nottitia de tutti li termini
 delle cose vedute per qualonche verso. La qual nottizia al
 pittore, sicome allo scultore, sempre è in potentia; ma lo 35
 scultore, havendo da cavare dove vol fare gli intervalli de'
 muscoli et da lassiare dove vole fare gli rilevi d'essi
 muscoli, non gli pò generare con debita figura oltre lo
 haver fatto la longhezza et larghezza loro, se lui non si
 move in traverso, pieghandosi od alzandosi in modo ch'esso 40
 vegga la vera altezza de' muscoli et la vera bassezza delli
 loro intervalli, e questi son giudicati dallo scultore in
 tal sito, e per questa via de dintorni si ricoreghano.
 Altrimenti, mai potrà bene li termini overo figure delle
 sue sculture. Et questo tal modo dicono essere fatica di 45
 mente allo sculture perché non acquista altro che fatica
 corporale perché in quanto alla mente, o no' dire giudicio,
 esso non ha se non in tal profilo a ricoreggiere li dintorni
 delle membre dove li muscoli sonno tropo alti. Et questo è
 il proprio ordinario delle sculture a condure a fine le 50
 opere sue. Il quale ordinario è condotto dalla vera
 notitia de tutti li termini delle figure di corpi per
 qualonche verso. Dice lo scultore, che se lui leva di

25 à] hà ED "h" interlined preceding "a"

27 aspetti. Et] ~ ^ et OR

28 basso. Il] ~ ^ il OR

31 avere] a'vere OR final "e" altered from [?] "o"; tocca. Ma] ~ ^ ma OR

34 verso. La] ~, la OR

35 potentia; ma] potentia ~ ^ OR

37 muscoli] mucoli OR; muscoli ED "s" interlined above "c"

42 questi] OR "i" altered from "o"

43 ricoreghano. Altrimenti] ricoreghano, altrimenti OR

45 sculture. Et] ~ ^ et OR

47 no'] Ludwig renders "vo'"

49 alti. Et] ~ ^ et OR; ordinario] odinario OR

51 sue. Il] ~ ^ il OR

53 verso. Dice] ~, ~ OR; lui] l'gli ED "lui" altered to "l'gli"

Moreover, the sculptor, in guiding his works to their end, has to make many contours for each figure in the round so that the resulting figure will be graceful from all views. These contours are only made graceful from the harmony of the height and the depth. He cannot place a truth if he does not stand away to see it in profile; that is, for the edges¹⁵³ of the concavity and projections¹⁵⁴ to be seen against the edge of the air that touches them.¹⁵⁵ Yet, truthfully, this does not add difficulty to the [sculptor's] artifice, considering that both he and the painter have the correct knowledge¹⁵⁶ about all the boundaries of things seen from every side. This knowledge is always at the capacity of both the painter and the sculptor; but the sculptor, having dug where he wants to make the intervals between muscles and having left [the material] where he wants the muscles in relief, cannot generate the proper figure, other than its length and thickness, if he does not move in a transverse [direction]. Kneeling or rising to see the true height of the muscles and the true depth of their intervals, the sculptor must make these judgments from such [kneeling or rising] positions in order to correct some of the turnings. Otherwise, he will never place the boundaries or figures of his sculptures. They say that this mode [of working] is mentally fatiguing for the sculptor, but [really] he acquires nothing besides body fatigue. In order to correct the contours of the members where the muscles are too high, he has nothing in mind, not to mention judgment, that he does not already have in this profile. This is the actual procedure¹⁵⁷ of sculptors to guide their works to completion. This procedure is guided by right knowledge about all the boundaries of the figures of bodies from every side. The sculptor says that once he takes away the excess he cannot add

¹⁵³ "Termini" must necessarily be translated in various ways depending on the context. Compare n. 2.

¹⁵⁴ Convex parts.

¹⁵⁵ McMahon translates: "these contours are produced by the meeting of high and low areas of stone, which he cannot place accurately unless he retires and views it in profile, that is, when the boundaries of concave areas and those in relief are seen in silhouette against the air that touches them."

¹⁵⁶ Information.

¹⁵⁷ Richter translates "proper way"; McMahon translates "proper and ordinary way," although "ordered" would be closer to the meaning of "ordinario."

superchio che non può agiongieri com'il pittore. Al quale
 si risponde, se la sua arte era perfetta, egli avrebbe 55
 sollevato mediante la notizia delle misure quel che bastava
 et non di superchio, il quale levamento nasse dalla sua
 ignoranza, la quale li fa levare più o meno che non debbe.
 Ma di questi non parlo, perché non sonno maestri ma
 guastatori di marmi. Li maestri non si fidano nel giudizio 60
 dell'occhio perché sempre inghanna. Come prova, chi vol
 dividere una linea in due parti eguali a giuditio d'occhio,
 che spesso la sperientia l'ingana. Onde per tale sospetto
 li boni giudici sempre temono il che no fano gl'ignoranti.
 E per questo, con la notitia delle misure di ciascuna lon- 65
 ghezza, grossezza e larghezza de' membri, si va al continuo
 governando, et così facendo no levando più del dovere.
 Il pittore ha dieci varij discorsi con li quali esso
 conduce al fine le sue opere, cioè luce, tenebre, colore,
 corpo, figura, sito, remotione, propinquita, moto e quiete. 70
 Il scultore sola ha da considerare corpo, figura, sito,
 moto e quiete. Nelle tenebre o luce non s'inpaccia perché
 la natura per sè li genera nelle sue sculture; del colore
 nulla; di remotione o propinquita, se ne inpaccia
 mezzanamente, cioè non adopra se no la prospettiva lineale, 75
 ma no quella de' colori, che si variano in varie distantie
 dall'occhio di colore et di notitia de' loro termini e
 figure. Adonque, ha meno discorso la scultura, e per
 conseguenza è da minore fatica d'ingegno che la pittura.

37

Il pittore et scultore

Dice lo scultore, la sua arte essere più degna che'lla
 pittura con ciò sia che quella è più aeterna per temer
 meno l'umido, e'l foco, e'l caldo, e'l freddo che la pittura.
 A costui si risponde che questa tal cosa non fa più dig- 5

- 54 pittore. Al] ~ ^ al OR
 58 ignoranza] ignorazia OR; debbe. Ma] ~ ^ ma OR
 60 marmi. Li] ~, li OR; giudizio] giuditio OR
 61 inghanna. Come] ~ ^ come OR
 63 spesso] OR "o" altered; ingana. Onde] ~ ^ onde OR
 64 gl'ignoranti. E] glignoranti ^ è OR
 70 remotione] OR "r" altered
 72 quiete. Nelle] ~, nelle OR
 78 figure. Adonque] ~. adonque OR

on as the painter can. To this one can reply that, if his art were perfect, from his knowledge of measure he would have taken away what was enough and not excess. His taking away the excess is born from his ignorance, which was to take away more or less than he should. But I shall not speak about these sculptors, because they are not masters but wasters of marble. Masters do not have faith in the judgment of their eye because [the eye] is always deceived. As proof, whoever wants to divide a line into two equal parts by the judgment of the eye is often deceived in experience. Hence, in their doubt, good judges always fear what the ignorant do not.¹⁵⁸ Thus, [it goes with experience that] masters, continuously governing and doing so with knowledge of measure in every length, thickness, and width of the members, do not take away more than they should.

The painter has ten varied discourses¹⁵⁹ to guide his works to their end: these are, light, darkness, color, body, figure, position, remoteness, nearness, motion, and rest.

The sculptor only has to consider body, figure, position, motion and rest. He is not concerned with darkness or light because nature itself generates them in his sculptures. There is nothing about color, and if the sculptor is moderately concerned with remoteness or nearness in his work, he will only adopt linear perspective, and not that of colors, which is the variation of colors at varied distances from the eye and knowledge of their boundaries and figures.¹⁶⁰ Therefore, sculpture has less discourse¹⁶¹ and, consequently, takes less labor of *ingegno*¹⁶² than painting.

37. A Painter and a Sculptor

A sculptor says that his art is more worthy than painting because, fearing humidity, fire, heat, and cold less than painting, it is more eternal. The response to him is that such a thing does not make the

¹⁵⁸ Richter translates “artists of good judgment are always on their guard.”

¹⁵⁹ See discussion of these “ten discourses” in the Commentary.

¹⁶⁰ Shapes. Richter translates: “which varies in tone and distinctions of outline and shape according to the varied distance from the eye.” McMahon translates: “at different distances from the eye, color, and clarity in the contours and forms of figures vary.”

¹⁶¹ Richter translates “fewer subjects”; McMahon translates “fewer matters.” See n. 18.

¹⁶² See n. 72.

nità nello scultore perché tal permanenza nasce dalla
 materia et no dall'artefice. La qual dignità pò ancora
 essere nella pittura, dipingendo con colori di vetro sopra i
 metalli et terra cotta, e quelli in fornace fare discorrere 10
 et poi pulire con diversi stromenti et fare una superfittie
 piana et lustra, come ai nostri giorni si vede fare in di-
 versi luoghi di Francia e d'Italia, e massime in Firenze
 nel parentado della Robbia, li quali hano trovato modo di
 condurre ogni grand opera in pittura sopra terra cotta co-
 perta di vetro. Vero, è che questa è sottoposta alle per- 15
 cussioni e rotture, sicome si sia la scultura di marmo, ma
 non è a destruttori come le figure di bronzo. Ma di etter-
 nità si congiongie cola scultura, et di bellezza la supera
 senza comparatione perché in quella si congiongie le due
 prospettive, et nella scultura tonda non è nissuna che no 20
 sia fatta dalla natura. Lo scultore nel fare una figura
 tonda fa solamente due figure, e non è infinite per li
 infiniti aspetti donde essa pò essere veduta. Et di queste
 due figure l'una è veduta dinanti e l'altra di dietro, et
 questo si prova no essere altrimenti perché, se tu fai una 25
 figura in mezzo rilievo veduta dinanzi. Tu non dirai mai vere
 fatto più opera in dimostratione che si faccia il pittore
 in una figura fatta nella medesima veduta e 'l simile inter-
 viene a una figura volta in dietro.
 Ma il basso rilievo è di più speculatione senza 30
 comparatione al tutto rilievo, e s'accosta in grandezza di
 speculatione al quanto alla pittura perché è obligato
 alla prospettiva. E 'l tutto rilievo non s'inpaccia niente
 in tal cognitione perché egli adopra le semplice misure
 come l'ha trovate al vivo. Et di qui, in quanto a questa 35
 parte, il pittore impara più presto la scultura che lo
 scultore la pittura. Ma per tornare al proposito di quel
 ch'è detto del basso rilievo, dico che quello è di men
 fatica corporale ch'el tutto rilievo ma assai di maggiore
 investigatione, con ciò sia che in quello s'ha da 40

7 artefice. La] ~ ^ la OR

15 vetro. Vero] ~, vero OR

17 bronzo. Ma] Bronzo ^ ma OR

21 natura. Lo] ~ ^ lo OR

23 veduta. Et] ~, et OR

26 dinanzi. Tu] ~, tu OR

33 prospettiva. E] ~ ^ è OR

35 vivo. Et] ~ ^ et OR

37 pittura. Ma] ~ ^ ma OR; proposito] poposito OR

sculptor more dignified because this permanence is born from the material and not from the artificer. This dignity can also belong to painting by painting with colored glazes on metal or terracotta; these [glazes] fuse in the furnace, and are then polished with different instruments to make smooth and lustrous surface, as one sees it being done these days in different places in France and Italy and especially in Florence by all the della Robbia relatives, who have found ways of guiding every great work in painting onto terracotta covered with glaze. True, it is subject to knocks and cracks, as is sculpture in marble, but it is not subject to vandals as are figures in bronze. Now painting has been joined to sculpture since eternity, and has surpassed it in beauty without any comparison, because it is joined by two perspectives, and sculpture in the round has nothing which nature does not produce. To make a figure in the round, the sculptor makes only two figures, and there need not be an infinite number for infinite views to be seen. Of these two figures, one is seen from the front and the other from behind, and this is proved to be no different from facing a figure made in medium relief. You would never say that you had performed more demonstrations than a painter who makes a figure from the same view and in the same way executes a figure turned backwards.¹⁶³

Now the speculations of low relief are greater than of full relief, without any comparison, and low relief approaches the grandness of speculation in painting insofar as it is bound to perspective. Full relief is not at all concerned with these cognitions because it adopts simple measures as it finds them in life. Since this is only one part, the painter learns sculpture more quickly than the sculptor [does] painting. Now to return to the proposition concerning what was said about low relief, I will say that it involves less physical fatigue than full relief, yet it is a much greater investigation, for the

¹⁶³ Richter translates: "you cannot claim to have shown more of the figure than a painter working from the same point of view, and the same happens with the back view." McMahon translates: "you will never say that you have put more of the work on display than a painter would do with a figure made from the same point of vantage and the same thing happens with a figure seen from the back." See discussion in the Commentary.

considerare la proportione che han' le distantie interposte
 infra le prime parte de' corpi e le seconde, et dalle
 seconde alle terze successivamente. Le quali, se da te
 prospettivo saranno considerate, tu non trovarai opera
 nissuna in bassa rilievo che no' sia piena d'errori ne' casi 45
 del più e men basso rilievo che si richiede alle parte de'
 corpi che sono più o men vicine al occhio. Il che mai
 sarà alcuno errore nel tutto rilievo perché la natura
 aiuta lo scultore, et per questo qualche fa di tutto rilievo
 manca di tanta difficoltà. 50

Seguita un nemico capitale dello scultore nel tutto e nel
 poco rilievo delle sue cose, le quali nulla vagliono se non
 hanno il lume accomodato simile a quello dove esse furono
 lavorate. Inperoché se'lle hanno il lume di sotto, le loro
 opere parrano assai e massime 'l basso rilievo, che quasi 55
 cancella nelli apposti giuditij la sua cognitione. Il che
 non pò accadere al pittore, il quale oltre al avere poste
 le membra delle sue cose. Esso s'è convertito nelli duoi
 offitij della natura, li quali sonno grandissimi, et questi
 sonn le due prospettive et il terzo, di grandissimo 60
 discorso, ch'è il chiaro et scuro delle ombre et de lummi,
 di che lo scultore è ignorante et è aiutato dalla natura
 nel modo ch'essa aiuta l'altre cose invisibili artificiose.

38

Come la scultura è de minor ingegno che la pittura, et
 manca in lei molte parti naturali

Adoperandomi io non meno in scultura che in pittura, et
 essercitando l'una e l'altra in un medesimo grado, mi pare
 con piccola imputatione poterne dare sententia quale sia di 5
 maggiore ingegno et difficoltà e perfettione, l'una che
 l'altra. Prima la scultura è sotoposta a certi lumi, cioè

43 successivamente. Le] ~ ^ la OR sècond "e" altered from "a" in "successi-
 vamente"

47 occhio. Il' ~ ^ il OR

54 lavorate. Inpero] ~ ^ inpero OR

55 assai] Ludwig suggests adding "mostruose" after this word

56 cognitione. Il] ~ ^ il OR

57 avere] OR preceded by deleted "vede"

58 cose. Esso] ~ ^ esso OR

62 ignorante] ignorante OR

63 invisible] Ludwig amends to "visibili"

38 2 manca] mancano ED "no" interlined following "ca"

7 l'altra. Prima], prima OR

proportions interposed by distance between the parts of bodies, from the first part to the second, and from the second to the third in succession must be considered in [low relief]. If you have not considered these [distances], perspectivist, you will discover no work¹⁶⁴ at all in low relief that is not full of errors in cases when greater and lesser relief is required for the parts of bodies as they are closer or farther from the eye. In full relief there will never be any such error because nature helps the sculptor, and for this reason whoever does full relief is deprived of such difficulty.

There follows from this an arch enemy of the sculptor. Whether in full relief or in low relief, [the sculptor's] things are worth nothing if they are not provided with lighting similar to the light in which they were worked. For, if they are lit from below, their works will look like many more, and to the greatest extent in low relief where cognition is almost cancelled out by these contrary judgments.¹⁶⁵ This does not happen to the painter, who goes beyond positioning things according to their members. The painter is converted by two of nature's greatest offices, that is, the two perspectives; and by a third [perspective], of the greatest discourse.¹⁶⁶ This is the *chiaroscuro* of shadows and lights. The sculptor is ignorant of this and he is helped by nature, in the [same] way that nature helps other things of imperceptible artifice.

38. How the *Ingegno*¹⁶⁷ of Sculpture Is Less than that of Painting and Is Deficient in Many Ways¹⁶⁸

Practicing sculpture no less than painting and exercising both to the same degree, it seems to me I can give a nearly faultless judgment on which of the two is of greater *ingegno*,¹⁶⁹ difficulty, and perfection. First, sculpture requires certain lights, that is, those

¹⁶⁴ That is, you will invent no sculpture executed in low relief.

¹⁶⁵ Richter translates: "if the light strikes from below they appear all distorted, most of all the *basso relievos* which have become almost unrecognizable." McMahon translates: "if the light is from below, the works will appear distorted, and this will be so most of all in bas-relief, because of shadows cast in a direction opposite to that intended, almost eliminating recognition of the work." "Assai" lacks a modifier; Richter, followed by Kemp/Walker, adds "mostruose." Kemp/Walker translates: "particularly in the case of low reliefs, which are almost negated and appear in reverse."

¹⁶⁶ See discussion of "discourse" in Commentary.

¹⁶⁷ See n. 72. Richter translates "intellectual"; McMahon translates "intelligence," but neither is satisfactory.

¹⁶⁸ Literally, "[sculpture] lacks many natural parts of painting." The original of most of this passage is extant in *Ms. A*, fols. 105r–104v. Variations are given in the Critical Apparatus.

¹⁶⁹ Compare n. 167.

di sopra, e la pittura porta per tutto seco lume et ombra. E
 lume et ombra è la importantia adonque della scultura. Lo
 scultore in questo caso è aiutato dalla natura del rilievo, 10
 che'lla genera per sè. Et il pittore per accidentale arte
 lo fa ne' lochi dove ragionevolmente lo farebbe la natura.
 Lo scultore non si pò diversificare nelle varie nature de'
 colori delle cose, la pittura non manca in parte alcuna. Le
 prospettive delli scultori non paiono niente vere, quelle 15
 del pittore paiono a centinaia de migliaia di la dall'o-
 pera. La prospettiva aerea è lontana dall'opera. Non pos-
 sono figurare li corpi trasparenti, non possono figurare i
 luminosi, non linee refflesse, non corpi luccidi come spechi
 et simili cose lustranti, non nebbie, non tempi oscuri et 20
 infinite cose che non si dicono per non tediare. Ciò
 che'lla ha, è che le più resistente al tempo benché a
 simile resistentia la pittura fatta sopra rame grosso co-
 perto di smalto bianco, et sopra quello depinto con colori
 di smalto e rimesso in foco e fatto chocere. Questa per et- 25
 ternità avanza la scultura. Potrà dire lo scultore, che
 dove fa un'errore non esserli facile il racconciarlo. Questo
 è debbole argomento a volere provare ch'una ismemoratagine
 irremediabile faccia l'opera più degna. Ma io dirò, bene
 che lo ingegno del maestro sia più difficile a racconciare 30
 che fa simili errori che non sia a racconciare l'opera da
 quello guasta.

8 ombra. E] ~, e OR

9 scultura. Lo] ~ ^ lo OR; natura] OR preceded by deleted "pittura"

11 sé. Et] ~ ^ et OR

12 natura. Lo] ~ ^ lo OR

14 alcuna. La] ~, le OR; scultori] OR preceded by deleted "colori"

15 paiono] patono OR; partono ED "i" interlined above "t"

16 dall'opera. La] ~ ^ la OR

17 dall'opera. Non] ~, non OR

21 tediare. Ciò che'lla] ~, cioch'ella OR

25 chocere. Questa] correre ^ questa OR (see Ms A apparatus)

26 scultura. Potrà] ~, potrà OR

27 racconciarlo. Questo] ~ ^ questo OR followed in the left margin in five lines:
 "Il resto del cap. è a car. 28, fac. 1 al segno W."

29 irremediabile] inremediabile OR; Irremediabile ED "i" deleted and "n"
 altered to "Ir"; degna. Ma] ~, ma OR

Ms. A, ff. 105r-104v

25 chocere. Questa] chocere ^ questa

26 dire lo scultore] dire

27 fa] fanno; esserli] esser

28 debbole] tristo

from above; but painting carries light and shadow entirely within itself. Light and shadow, therefore, are important for sculpture. The sculptor in this respect is aided by the nature of relief. [Nature] generates relief by itself. The painter, by [his] accidental art,¹⁷⁰ makes relief in places where nature would reasonably make it. The sculptor cannot diversify the varied nature of the colors of things. Painting is not missing any parts.¹⁷¹ The perspectives [made by] sculptors do not appear true at all, while those of the painter appear hundreds of miles away in his work. Aerial perspective is absent from the work [of sculptors]. They cannot figure transparent bodies, nor can they figure luminous things, nor reflected lines, nor lucid bodies like mirrors and similar lustrous things, nor mists, nor bad weather and infinite [other] things which I will not say because it would be tedious. What sculpture has is the greatest resistance to time, although painting made on copper thickly covered with white enamel, painted with colored enamel, returned to the furnace, and refired, has a similar resistance. It lasts for an eternity beyond sculpture. The sculptor could say that, if he makes an error it is not easy [for him] to repair it. It is a weak argument to try to prove that an irremediable oversight makes a work more worthy. Now I would say, yet more difficult would it be to repair the *ingegno*¹⁷² of a master who makes errors like these, than it would be to repair the work he spoils.

¹⁷⁰ That is, the painter deals with the “accidents” of nature, which are qualities of light, darkness, color, body, figure, place, remoteness, propinquity, motion and rest: the “ornaments of nature” (compare Chapter 20). See discussion in the Commentary.

¹⁷¹ Kemp/Walker translates: “Painting is not deficient in any way.”

¹⁷² Richter and McMahon translate “mind.” Compare nn. 167 and 170.

Nissuna comparatione è dallo ingegno et artificio e discorso della pittura a quello della scultura, se non della prospettiva causata dalla virtù della materia et non dalle artefice. Et se lo scultore dice no' poter raccontare la materia levata di superchio alla sua opera come pò il pittore, qui si risponde che quel che troppo leva, poco intende, et non è maestro perché se lui ha in potestà le misure, lui non levarà quel che non debbe. Adonque, diremo tal difetto essere dell'operatore e non della materia. 35 40

Ma la pittura è di maraviglioso artificio, tutta di sottilissima speculatione, delle quali in tutto la scultura n'e' privata per essere di brevissimo discorso.

Rispondesi allo scultore che dice che'lla sua scientia è più permanente che la pittura, che tal permanentia è virtù della materia sculta e non dello scultore. Et in questa parte lo scultore non se la debbe attribuire a sua gloria ma lasciarla alla natura, creatrice di tale materia. 45

39

Dello scultore et pittore

Lo scultore a lla sua arte de maggior fatica corporale ch'el pittore, cioè più mechanica et di minor fatica mentale. Cioè che ha poco discorso rispetto alla pittura, perché esso scultore solo leva et il pittore sempre pone. Lo scultore sempre leva d'una materia medesima, et il pittore sempre pone di varie materie. Lo scultore solo recerca i lineamenti che circondano la materia sculta, et il pittore ricerca li medesimi lineamenti et, oltre a quelli, ricerca ombra e lume, colore e scorto. Delle quali cose la natura n'aiutta di continuo lo scultore, cioè con ombra e 5 10

33 artificio] OR altered "cio" from [?] "zio"

34 se non della prospettiva] Ludwig amends by adding "che non s'inpaccia" preceding this phrase

36 artefice. Et] artefice, et OR

40 levarà] OR preceded by deleted "dovea"; debbe. Adonque] ~, adonque OR

46 permanente] parmanente OR

47 scultore. Et] ~ ^ et OR

39 2 à lla] ha la ED "ha" interlined above deleted "al"

3 mechanica] OR first "c" altered from "r"

4 mentale. Cioe] ~ ^ cioe OR

5 pone. Lo] ~, lo OR

7 materie. Lo] ~, lo OR

10 scorto. Delle] ~ ^ delle OR

[In top left margin: The rest of the chapter is at Carta 28, Fac. 1, at the sign W.]¹⁷³

There is no comparison between the *ingegno* and artifice and discourse of the painting and sculpture, unless it is in the perspective¹⁷⁴ caused by virtue of the material and not by artifice. If the sculptor talks about not being able to repair the material which was taken away from the covering¹⁷⁵ of his work, as the painter can, we respond that he who takes away too much understands [too] little. And he is not a master because if he had measure in his capacity, he would not take away what he should not. Therefore, we would say that such a defect belongs to the worker and not to the material.

But painting has marvelous artifice, all of the subtlest speculation, from which all sculpture is deprived by having the briefest discourse.¹⁷⁶

One can reply to the sculptor who says that his science is more permanent than painting, that this permanence is the virtue¹⁷⁷ of the material which is sculpted, and not [the virtue] of the sculptor. The sculptor should not attribute the glory to himself for this part but let nature, the creator of his material, have the glory.

39. On the Sculptor and the Painter

The corporeal difficulty¹⁷⁸ of the sculptor's art is greater than the painter's, that is, the labor is more mechanical and less mental. That is, with respect to painting, the sculptor's art possesses little discourse,¹⁷⁹ because the sculptor only takes away and the painter is forever adding on. The sculptor always takes away [only] one material, and the painter is always adding on various materials. The sculptor only searches for the lines¹⁸⁰ which surround the material which is sculpted, and the painter searches for the same lines and, besides this, he searches for shadow and light, color, and foreshortening. Nature continuously helps the sculptor with these

¹⁷³ Chapter continues on p. 282. See discussion in the Commentary.

¹⁷⁴ Kemp/Walker translates "spatial definition."

¹⁷⁵ "Superchio" can connote formless matter, an allusion which Leonardo may have intended in this case: see Commentary.

¹⁷⁶ Richter translates "very little science"; McMahon translates "only brief analysis." See n. 18 and Commentary.

¹⁷⁷ Richter translates "merit"; McMahon translates "belongs to."

¹⁷⁸ "Fatica" has two shadings here: in this clause it suggests a positive quality, but in the following clause it becomes a criticism of sculpture. Richter translates "physical exertion"; McMahon translates "greater fatigue," without distinction.

¹⁷⁹ Richter translates "scientific research"; McMahon translates "thought." See n. 18.

¹⁸⁰ Contours.

lume e prospettiva, le quali parti bisogna ch'el pittore
 se'lle acquisti per forza d'ingegno e si converta in essa
 natura, et lo scultore le trova del continua fatte. Et se
 tu dirai, glie alcuno scultore che intende quello ch'intende 15
 il pittore, io ti rispondo che donde lo scultore tende le
 parti del pittore, ch'esso è pittore, et dove esso non
 l'intende, ch'egli è semplice scultore. Ma il dipintore ha
 di bisogno d'intendere sempre la scultura, cioè il
 naturale, che ha il rilievo che per sè genera chiaro e scuro 20
 et scorto. E per questo molti ritornano alla natura per non
 essere scientiati in tale discorso d'ombre et lume et
 prospettiva. E per questo retrano il naturale perché solo
 tal ritrare n'ha messo in uso senza altra scientia o
 discorso di natura in tal proposito. E di questi ce n'è 25
 alcuni che per vetri od altre carte, o veli trasparenti,
 guardano le cose fatte dalla natura, et qui vi nelle
 superfitie delle trasparentie le profilano. Et quelle con
 le reghole delle proportionalità le circondano di profili,
 cressendole alcuna volta dentro a tali profili occupano di 30
 chiaro e scuro, nottando il sito, la quantita, e figura
 d'ombre et lumi. Ma questo è da essere laudato 'n quelli
 che sanno fare di fantasia a presso alli effetti di natura,
 ma sol usano tal discorsi per levarsi al quanto di fatica et
 per non mancare in alcuna particula della vera imitatione di 35
 quella cosa, che con procesione si debbe fare simigliare.
 Ma questa tale inventione è da essere vituperata in quelli
 che non sano per sè ritrare, nè discorrere con l'ingegno
 loro, perché con tale pegritia sono destruttori del loro
 ingegno, nè mai sano operare cosa alcuna bona senza tale 40
 aiuto. E questi sempre sono poveri e meschini d'ogni loro
 inventione o componimento di storie, la qual cosa è il fine
 di tale scientia, come a suo loco sia dimostrato.

18 l'intende] [?] l'indendi OR; l'intende ED "t" and "e" altered from illegible original; scultore. Ma] ~ ^ ma OR

21 scorto. E] ~, et OR

23 prospettiva. E] ~ ^ è OR

25 proposito. E] ~ ^ e OR

28 profilano. Et] ~ ^ et OR

32 lumi. Ma] ~ ^ ma OR

33 a presso] [?]ap..sso [illegible] OR; apresso ED altered over illegible original

36 procesione] Ludwig suggests amending to "precisione"; simigliare. Ma] ~ ^ ma OR

41 aiuto. E] ~ ^ e OR; questi] OR preceded by deleted "per"; sempre] senpre OR

things, that is, with shadow and light, and perspective. It is necessary for the painter to acquire these parts by the strength of [his] *ingegno*,¹⁸¹ and be converted into nature, and the sculptor finds them from [nature's] continual actions.¹⁸² And, if you would say that some sculptors understand what the painter understands, I would respond to you [by saying] that, insofar as a sculptor understands the roles of the painter, he is a painter, and where he does not understand him, he is a mere sculptor. Now the painter always needs to understand sculpture, that is, natural relief which generates chiaroscuro and foreshortening by itself. Thus, many [painters] who are not knowledgeable in this discourse¹⁸³ of shadows and light and perspective return to nature. Thus they portray the natural since they can practice only this imitation [of relief] without further science or discourse on nature with this purpose. Some of these painters examine things made by nature through sheets of glass or something else, or transparent veils, and they trace profiles on the surface of the transparencies. According to the rules of proportionality, they circumscribe [things] sometimes making them grow from profiles by filling these profiles in with chiaroscuro, noting the position, quantity, and figure of the shadows and lights. Now this is to be praised in those who know how to make the *fantasia* approach the effects of nature, but only if they use these discourses to rise above labor, and not to lack some detail in the true imitation of these things, which should [be to] faithfully convey the resemblance.¹⁸⁴ But such invention is to be reviled in those who do not know how to imitate without it, or how to use their *ingegno* to discourse,¹⁸⁵ for they destroy their *ingegno* with laziness, nor can they ever produce a good thing without this aid.¹⁸⁶ And so they are always poor and wretched in all their inventions or compositions of narratives, which as will be demonstrated in its own place, is the final aim of this science.

¹⁸¹ Richter translates "ingenuity"; McMahon translates "mind." Compare nn. 167, 169, and 185.

¹⁸² Richter translates "the sculptor always finds them ready-made."

¹⁸³ Richter translates "analyzing"; McMahon translates "reasoning." Compare nn. 18 and 179.

¹⁸⁴ Richter translates: "and not to fail in the slightest particular in the truthful imitation of a thing whereof a precise likeness required . . ." McMahon translates: "and in order not to be lacking in any particular in the true imitation of that which ought to be made precisely like nature." See Commentary.

¹⁸⁵ Richter translates "uses his own mind to analyze"; McMahon translates "to reason about nature with their minds." See nn. 18, 179, 181, and 183.

¹⁸⁶ Device.

40

Comparatione dalla pittura alla scultura

La pittura è di maggiore discorso mentale et di maggior
 artificio e meraviglia che la scultura, con ciò sia che ne-
 cessità constringe la mente del pittore a trasmutarsi
 nella propria mente di natura, et sia interprete infra essa 5
 natura et l'arte. Comendando con quella le cause delle sue
 demonstrationi, constrette dalla sua legie et in che modo le
 similitudini delli obbietti circostanti al'occhio concor-
 rino con li veri simulacri alla poppilla del occhio. E infra
 li obbietti eguali in grandezza, quale si dimostrara ma- 10
 giore a esso occhio, et infra li colori eguali qual si dimo-
 strerà più o men oscuro o più o men chiaro, et infra le
 cose d'egual bassezza quale si dimostrerà più o men bassa,
 et di quelle che sono poste in altezza eguale quale si dimo-
 strerà più o men alta, et delli obbietti eguali posti in 15
 varie distantie perché si dimostreranno men noto l'un che
 l'altro. Et tale arte abbraccia e restringe in sé tutte le
 cose visibili, il che far non pò la povertà della scul-
 tura, cioè li colori di tutte le cose et loro diminutioni.
 Questa figura le cose trasparenti e lo scultore ti mostrerà 20
 le naturali senza suo artificio. Il pittore ti mostrerà
 varie distantie con variamento del colore de l'aria inter-
 posta infra li obbietti e l'occhio, lui le nebbie per li
 quali con difficoltà depenetrano le spetie delli obbietti,
 lui le pioggie che mostrano dopo sè li nuvoli con monti et 25
 valli, lui le polvere che mostrano in sè et dopo sè li
 combattenti d'essa mottori, lui ti fiumi più o men densi,
 questa ti dimostreranno li pessi scherzanti infra la super-
 fitie dell'acqua et il fondo suo, lui le pulite giare con
 varij colori possarsi sopra le lavate arrene del fondo de' 30
 fiumi circondati dalle verdeggianti herbe dentro alla super-
 fitie del'acqua, lui le stelle in diverse altezze sopra di
 noi, et così altri innumerabili effetti alli quali la scul-

40 6 l'arte. Comendando] ~ ^ comendando OR

9 occhio. E] ~, è OR

17 l'altro. Et] ~ ^ et OR

19 diminutioni. Questa] ~ ^ questa OR; artificio. Il] artefi[?]tio ^ il OR;
 artificio ^ il ED "t" altered to "ci"

23 obbietti] obbitti OR; obbietti ED "t" altered to "e"

27 fiumi] Ludwig suggests amending to "fumi"

29 lui] OR preceded by deleted "fe"

40. Comparison of Painting to Sculpture

Painting is of greater mental discourse and artifice and is a greater marvel than sculpture in that necessity compels the mind of the painter to transmute itself into the actual mind of nature to become an interpreter between nature and art. Praising the causes of nature's demonstrations¹⁸⁷ in this, the painter is compelled by the laws of nature in the way that the similitudes¹⁸⁸ of objects which surround the eye act together with the real simulacri on the pupil of the eye.¹⁸⁹ Among objects of equal greatness, it will be demonstrated which is larger to the eye; among equal colors, it will be demonstrated which is darker, more or less, than the other, and which is more or less bright; among objects which are equally low, it will be demonstrated which is more or less low, of things which are placed equally high, it will be demonstrated which is more or less high; and of objects placed at equally varied distances, it will be demonstrated why one appears less distinct than the other. And this art [of painting] embraces and contains within itself all perceptible things, which the poverty of sculpture cannot do, that is [show] the colors of all things and their diminution.¹⁹⁰ [Painting] figures transparent things and the sculptor will show you natural things without [further] artifice. The painter will demonstrate various distances by the variation of color of the air interposed between objects and the eye. He will demonstrate how the species of objects penetrate mists with difficulty. He will demonstrate how mountains and valleys are seen through clouds in the rain. He will demonstrate dust itself, and how the combattants raise a commotion in it. He will demonstrate how fish play under the surface of the water and in its depths. He will demonstrate the varied colors of polished pebbles lying on the washed sand in river beds, surrounded by verdant grasses beneath the surface of the water. He will demonstrate the different heights of the stars above us and similarly, innumerable other effects to which sculpture does not

¹⁸⁷ Richter and McMahon translate "manifestations."

¹⁸⁸ "Similitude" and "simulacrum" are optical terms. See Commentary.

¹⁸⁹ Kemp/Walker translates: "in what way the image of the objects surrounding the eye converge on the pupil of the eye, as true semblances of objects."

¹⁹⁰ Richter translates "the varying intensity and the transparency of colors."

tura non aggiongíe. Dice lo scultore ch'el basso rilievo è
 di spetie di pittura. Questo in parte si accetterebbe, in 35
 quanto al disegno, perché partecipa de prospettiva, ma in
 quanto all'ombre e lumi è falso in scultura e in pittura
 perché l'ombre che in esso basso rilievo sonno della natura
 del tutto rilievo, come sonno l'ombre delli scorti che non ha
 la oscurità della pittura o scultura tonda. Ma quest'arte 40
 è una mistione di pittura et scultura.

41

Equiparatione da pittura a scultura

Manca la scultura della bellezza de' colori, manca
 della prospettiva de' colori, manca della prospettiva et
 confusione de' termini delle cose remote dall'occhio,
 imperoché così farà cognito li termini delle cose prop- 5
 cinque come delle remote. Non farà l'aria interposta infra
 l'obbietto remoto e l'occhio occupare più esso obbietto che
 obbietto vicino. Non farà i corpi luccidi e trasparenti,
 come le figure vellate che mostrano la nuda carne sotti i
 veli a quella anteposti. Non farà la minuta giarra di 10
 varij colori sotto la superfittie delle trasparenti acque.

42

Comparazione della pittura alla scultura

La pittura è di maggior discorso mentale che la
 scultura, e di maggior arteficio, con ciò sia che'lla
 scultura non è altro che quel che'lla pare; cioè nel es-
 sere corpo rilevato et circondato d'aria et vestito da 5
 superfittie oscura et chiara come sonno gli altri corpi na-
 turali. Et l'arteficio è condotto da dui operatori, cioè
 dalla natura et da l'huomo. Ma molto è maggiore quello della
 natura, con ciò sia che se'lla non socoresse tale opera con

34 aggiongíe. Dice] ~, dice OR

35 pittura. Questo] ~ ^ questo OR

40 tonda. Ma] ~ ^ ma OR

41 1 Equiparatione] ED * adds the following in the left margin: "Lo A. car.29"

6 remote. Non] ~ ^ non OR

8 vicino. Non] ~, non OR

10 anteposti. Non] ~ ^ non OR

42 7 naturali. Et] ~ ^ et OR; l'arteficio] OR "r" altered from "t"

8 huomo. Ma] ~, ma OR

aspire. The sculptor says that low relief is a species of painting. This could be accepted in part, as far as *dissegno*¹⁹¹ [is concerned], because low relief participates in perspective, but as far as low relief participates in shadows and lights, it is false both as sculpture and as painting, because the shadows in the low relief correspond to the nature of full relief, and so do the shadows of the foreshortenings,¹⁹² which do not have the depth of painting or sculpture in the round. Rather, this art is a mixture of painting and sculpture.

41. Sculpture Put upon a Par¹⁹³ with Painting

Sculpture is missing the beauty of colors, it is missing the perspective of colors, it is missing the perspective and confusion¹⁹⁴ of boundaries of things distant from the eye, because the boundaries of things nearby will be known just like those which are distant. The air interposed between a distant object and the eye will not fill the space around that object more than it does around a nearby object. [Sculpture] will not produce lucid and transparent bodies like veiled figures which show nude flesh under veils laid against it. It will not produce the minute pebbles of varied colors below the surface of transparent water.

42. Comparison between Painting and Sculpture

The mental discourse¹⁹⁵ of painting is greater than that of sculpture and it is of greater artifice because sculpture is not other than what it appears [to be]; that is, in being a body in relief and encompassed by air and clothed by dark and bright surfaces, as other natural bodies are. The artifice is guided by two operators, that is by nature and by man. Yet nature's artifice is much greater, because if nature did not rescue the work with shadows which are more or less dark,

¹⁹¹ See n. 98.

¹⁹² That is, the actual shadows cast by foreshortened figures in relief do not correspond to the shadow cast by the fully round figure the foreshortened figure represents.

¹⁹³ McMahon translates "parallel." See Commentary.

¹⁹⁴ Mingling.

¹⁹⁵ Richter translates "thought"; McMahon translates "mental analysis." See nn. 18 and 185.

ombre più o meno oscure et con li lumi più o men chiari, 10
 tale operatione sarebbe tutta d'un colore chiaro et scuro, a
 similitudine d'una superficie piana. Et oltre questo, vi
 s'aggiungie l'adiutorio della prospettiva, la quale con li
 suoi scorti aiuta voltare la superfitie muscolosa de' corpi
 a diversi aspetti, occupando l'un muscolo l'altro con mag- 15
 giore o minore occupatione. Qui risponde lo scultore et
 dice: se io non faccessi tali muscoli, la prospettiva non me
 gli scorterebbe. Al quale si risponde che se non fusse
 l'aiutto del chiaro et scuro, tu non potresti fare tali
 muscoli perché tu non li potresti vedere. Dice to scultore 20
 che glie lui che fa nascere il chiaro et lo scuro col suo
 levare della materia sculta. Rispondesi, che non lui ma la
 natura fa l'ombra et non l'arte, e che se lui sculpisse
 nelle tenebre, lui non vederebbe nulla, perché non n'è
 varietà, nè ancho nelle nebbie circondanti la materia 25
 sculta con eguale chiarezza, non si vederebbe altro che li
 termini della materia sculta nelli termini della nebbia che
 con lei confina. Et dimando a te, scultore, perché tu non
 conduci opere a quella perfettione in campagna circondate da
 uniforme lume universale de l'aria, come tu fai ad un lume 30
 particolare che d'alto descenda alla laminatione della tua
 opera. Et se tu fai nascere l'ombra a tuo beneplacito nel
 levare della materia, perché non le fai medesimamente na-
 scere nella materia sculta al lume universale come tu fai
 nel lume particolare? Certo tu t'inghani che l'è altro 35
 maestro che fa esse ombre e lumi al quale tu famiglio però
 pari la materia dove lui inprime essi accidenti. Si che non
 gloriare de l'altrui opere. A te sol basta le longhezze et
 grossezze delle membra de qualonque corpo e le loro pro-

10 chiari] OR preceded by deleted "oscuri"

12 piana. Et] ~ ^ et OR

16 occupatione. Qui] ~ ^ qui OR;

17 : se] ^ ~ OR; io] lui OR; io ED "lui" altered to "l'gli" and deleted and "io"
interlined above deleted "l'gli"

18 scorterebbe. Al] ~. al OR

20 vedere. Dice] ~ ^ vedere OR

22 sculta. Rispondesi] ~, rispondesi OR

23 lui] deleted by ED

26 con] non OR; con ED "n" altered to "c"

28 confina. Et] ~ ^ et OR

32 opera. Et] ~ ^ et OR

35 particolare? Certo] ~, certo OR

37 accidenti. Si] ~ ^ si OR

38 opere. A'] ~ ^ a' OR; longhezze] OR final "e" altered from "a"

and with lights which are more or less bright, these operations would all be one bright or dark color, the similitude of a single flat surface. Besides this, nature assists with perspective which, by means of foreshortenings, helps turn the muscled surfaces of bodies so that one muscle fills the space of the other one to a greater or lesser extent from different points of view.¹⁹⁶ Here the sculptor responds and says, "if I had not made these muscles, perspective would not foreshorten them for me." To which it may be replied that, "if you were not helped by chiaroscuro, you could not have made these muscles because you would not have been able to see them." The sculptor says that he gives birth to the chiaroscuro by taking away material in sculpting. It might be replied that neither he nor his art but nature produces the shadow and that, if he sculpted in the dark, he would see nothing because there is variety neither in the dark nor when the mists which encompass material to be sculpted are of the uniform brightness, so he would only see the boundaries of the material to be sculpted where the mists abut the boundaries. Let me ask you, sculptor, why you do not guide works to perfection in the countryside surrounded by the uniform, universal light of the air, in the same way as you do in the particular light which descends from above to illuminate your work. If you give birth to shadow on your own good judgment¹⁹⁷ by taking away material, why can you not give birth to the sculpted material in universal light in the same way as you do in the particular light? Certainly, you deceive yourself, in that it is another master who makes the shadow and lights for whom you, his servant, prepare the material in which he impresses those accidents.¹⁹⁸ Do not glorify yourself through the works of others. The lengths and thicknesses of the members of a body and their

¹⁹⁶ Richter translates: "[Nature] helps to turn the planes of muscles of bodies to face different directions as one muscle recedes more or less behind another." McMahon translates "[Nature] helps to make the muscular surfaces of bodies stand out at several points, one muscle covering another to a greater or lesser extent."

¹⁹⁷ Richter translates "at will"; McMahon translates "absolute power."

¹⁹⁸ See n. 63 and Commentary.

portioni, e questo è tua arte. Il resto, ch'è il tutto, è 40
 fatto dalla natura, maggiore maestra di te. Dice lo scultore
 che farà di basso rilievo, et che mostrerà per via di pros-
 pectiva quel che non è in atto. Rispondessi, che la pros-
 pectiva è membro della pittura et, che in questo caso lo
 scultore si fa pittore; come s'è dimostrato dinanzi. 45

43

Escusatione dello scultore

Dice lo scultore che se lui leva più marmo che non
 debbe, che no' pò ricoreggiere il suo errore come fa il
 pittore. Al quale si risponde, che chi leva più che no'
 debbe, che non è maestro perché maestro si dimanda quello 5
 che ha vera scientia della sua operatione. Risponde lo
 scultore, che lavorando il marmo, si scopre una rottura che
 ne fu causa lei, c'è non il maestro di tale errore.
 Rispondesi, tale scultore esser in queste caso come quello
 pittore a chi si rompe od offendo la tavola donde lui 10
 dipingie. Dice lo scultore che non pò fare una fighura che
 non ne faccia infinite per gl'infiniti termini, ch'ano le
 quantità continue. Rispondesi che gl'infiniti termini di
 tal figura si riducono in due mezze figure, cioè una mezza
 dal mezzo indietro et l'altra mezza dal mezzo in anzi. Le 15
 quali, sendo ben proportionate, compongono una figura tonda,
 e queste tali mezze havendo li loro debbiti rilevi in tutte
 le loro parti, risponderano per sé sanz'altro magistero.
 Tutte l'infinite figure che tale scultore dice haver fatte,
 ch'el medesimo si pò dire a uno che faccia un vaso al torno 20
 perché anchora lui pò mostrare il suo vaso per infiniti
 aspetti.

Ma che pò fare lo scultore che li accidenti naturali
 al continuo non lo soccorino in tutti i nescessari et

40 arte. Il] ~, il OR

41 te. Dice] ~, dice OR

43 atto. Rispondessi] ~ ^ rispondessi OR

43 2 che se] che è se OR

4 pittore. Al] ~ ^ al OR

6 operatione. Risponde] ~ ^ risponde OR

8 errore. Rispondesi] ~ ^ rispondesi OR

11 dipingie. Dice] ~ ^ dice OR

13 continue. Rispondesi] ~, rispondesi OR

15 anzi. Le] ~ ^ le OR

18 magistero. Tutte] ~ ^ tutte OR

proportions alone are enough for you, and this is your art. The rest, which is everything, is made by nature, a greater master than you. The sculptor says he will make a low relief whose perspective will show in action¹⁹⁹ that which is not. You might respond that perspective is part of painting, so that in this case, the sculptor is made into a painter, as it has been previously demonstrated.

43. Excusation²⁰⁰ of the Sculptor²⁰¹

The sculptor says if he takes away more marble than he should, he cannot mend his error as the painter can. To which it is replied that whoever takes away more than he should is not a master because one is called a master who has true science of his operations. The sculptor responds that if a crack is discovered in working the marble, the crack was the cause and he is not the master of this error. We might respond that such a sculptor in that is like the painter whose panel splits or is damaged while he paints. The sculptor says that he cannot make one figure unless he makes an infinite [number] of them, due to the infinite edges²⁰² that continuous quantities have. We might respond that the infinite edges of such figures can be reduced to two half-figures, one of which is the back half and the other of which is the front half. If these two halves are well-proportioned, they will compose one figure in the round, and if all the parts of these two halves have the proper relief, they will correspond to the [whole] without any further masterly skill. The same can be said about all the infinite figures the sculptor says he must make about someone who turns a vase,²⁰³ for a vase can also be shown from an infinite [number of aspects].

Now what could the sculptor do if natural accidents²⁰⁴ did not continually rescue him in all the necessary and opportune cases?

¹⁹⁹ McMahon translates “in fact.”

²⁰⁰ Richter translates “excuse”; McMahon translates “apologia.” The Italian form of this word was frequently employed in the sense of pardoning sins.

²⁰¹ Pedretti, *Commentary*, 1: 83 (referring to Chapter 43 incorrectly as Chapter 44), suggests that this passage is a continuation of the preceding one; see *Commentary*.

²⁰² Contours.

²⁰³ Richter adds “on his wheel.”

²⁰⁴ Richter translates “nature”; McMahon translates “accidents of nature”; see n. 63.

oportuni casi? Il quale aiuto privato d'inghano, e questo 25
 è il chiaro et scuro che pittori dimandano lume et ombra.
 Li quali il pittore con grandissima speculatione da sè
 generatoli con le medesime quantità e qualità et
 proportioni aiuttandosi, che la natura senza ingegno dello
 scultore aiuta la scultura. E la me desima natura aiuta tale 30
 artefice con le debbite diminutioni, con la qual la
 prospettiva per sè produce naturalmente senza discorso
 dello scultore. La qual scientia il pittore fa bisogno che
 col suo ingegno s'nguisti.
 Dira lo scultore far opere più etterne ch'el pittore. 35
 Qui si risponde esser virtù della material sculta et non
 dello scultore che la sculpisce, e se'l pittore dipingie in
 terra cotta con vetri, essa sarà più etterna che la
 scultura.

44

Dell'obbligo ch'a la scultura col lume, e non la pittura

Se la sculturaavrà il lume di sotto parrà cosa
 mostruosa e strana. Questo non accade alla pittura, che
 tutte 'e parti porta con seco.

45

Diferentia ch'è dalla pittura alla scultura

La prima maraviglia che apparisse nella pittura è il
 parer spicchato dal muro, od altro piano, et inganare li
 sottili giudicij con quella cosa che non è divisa dalla
 superfitie della pariete. Qui in questo caso lo scultore fa 5
 l'opere sue, che tanto paiono quanto elle sonno. E qui è
 la causa ch'el pittore bisogna che faccia l'ufficio della

25 casi? Il] ~ ^ il OR

26 ombra. Li] ~ ^ li OR

30 scultura. E] ~ ^ è OR

33 scultore. La] ~ ^ la OR

34 s'nguisti] Ludwig renders "si l'acquisti"

35 Dira] ED at line beginning "Dira" preceded in left margin: "Lo A.c.29."; pittore. Qui] ~, qui OR

37 sculpisce] OR preceded by deleted "superfitie"

39 scultura] ED followed in the right margin: "Lo.A.car.29"

44 1 scultura] ED followed in the right margin: "Lo.A.car.17"

45 5 pariete. Qui] ~, qui OR

6 sonno. E] ~, è OR

Nature's aid, free of deception,²⁰⁵ is chiaroscuro, which painters call light and shadow. The painter generates it by himself with the greatest speculation, helping himself with the same quantities and qualities and proportions with which nature helps sculpture without the sculptor's *ingegno*. And the same nature helps such artificers with the proper diminutions, which produce perspective naturally, by itself, without the discourse of the sculptor. The painter has to acquire this science by his *ingegno*.

The sculptor will say that he produces works more eternal than the painter. Here one can reply that this is the virtue²⁰⁶ of the material which is sculpted and not of the sculptor that sculpted it, and if a painter paints on terracotta with glazes, that will be more eternal than sculpture.

44. On the Indebtedness of Sculpture to Light, But Not of Painting

If sculpture is illuminated from below it will seem to be a monstrous and strange thing. This does not happen to painting, which carries all its parts within itself.

45. The Difference Between Painting and Sculpture

The prime marvel to appear in painting is that it appears detached from the wall, or some other plane, and that it deceives subtle judges²⁰⁷ about that thing that is not divided from the surface of the wall. In this [specific] case, when the sculptor makes his works, what appears is as much as there is. This is the reason the painter needs to make it his duty to know how the shadows are accompa-

²⁰⁵ Richter translates "never errs"; McMahon translates "never disappoints."

²⁰⁶ Richter translates "merit"; McMahon translates "to the credit."

²⁰⁷ Richter and McMahon translate "judgment."

nottitia nelle ombre che si incompagne de lumi. Allo
 scultore non bisogna tale scientia perché la natura aiuta
 le sue opere com'essa fa anchora tutte l'altre cose 10
 corporee, dalle quali tolto la luce sonno d'un medesimo
 colore, et rendutole la luce, sonno di varij colori cioè
 chiaro et scuro. La seconda cosa ch'el pittore con gran
 discorso bisogna che con sottile investigatione pongha le
 vere qualità e quantità dell'ombre e lumi. Qui la natura 15
 per sè le mette nelle opere dello scultore. La prospettiva
 investigatione è inventione sotilissima delli studij
 matematici, la quale per forza di linee fa parere remoto
 quello ch'è vicino, et grande quello ch'è piccola. Qui la
 scultura è aiutata dalla natura in questo caso, et fa 20
 senza inventione del scultore.

Notta come il sequeute mezo capitolo

Va posto dietro a l'altro suo mezo qual comincia a
 carte 23 del presente libro et resta diviso a car. 23,
 fac. 2, al segno W, et finisce, così: L'OPERA da quello
 guasta. Errore occorso per la lettera ch'è mancina et 5
 perché era trameggiato su n'altra carta al contrario.

38 [continued]

W

Noi sapiamo bene che quello che sara pratico non fara
 simili errori, anzi con buone regoli andrà levando tanto 10
 poco per volta che conducera bene la sua opera. Anchora lo
 scultore, se fa di terra o ciera, può levare e porre, et
 quando è terminata con facilita si gitta di bronzo. Et
 questa è l'ultima operazione et la più permanente ch'abbi

8 lumi. Allo] ~, a'llo OR

9 bisogna] Ludwig suggests adding "è" preceding this word

13 scuro. La] ~ ^ la OR

15 lumi. Qui] ~, qui OR

16 scultore. La] ~, la OR; Ludwig suggests adding "Tertia è" preceding "La"

19 piccola. Qui] piccoli[?] ^ qui OR; piccolo ^ qui ED "c" interlined above "c"

and final [?] "i" altered to "o"

38* 7 Notta]*

10 opera. Anchora] ~, anchora OR

12 bronzo. Et] ~ ^ et OR

Ms. A, ff. 105r-104v

8 pratico] pratico e bono

10 conducera bene] ben chonducerà

14 sottoposta alla ruina, che non e' il] ssottoposta alle ruine, e non lo

nied by the lights. This science is not needed by the sculptor because nature helps his works just as it makes all other corporeal things. When light is taken away from these things, they are of the same color, and when the light is restored, they are of varied colors, that is, *chiaroscuro*. The second thing that the painter with great discourse needs²⁰⁸ is to place the true quality and quantity of the shadow and lights with subtle investigation. Here nature alone puts them in the work of the sculptor. Perspective,²⁰⁹ a most subtle investigation and invention of mathematical studies, by the power of lines, makes what is nearby appear remote, and what is small appear great. Sculpture is helped by nature in this respect and does it without any invention by the sculptor.

Note concerning the following half-chapter²¹⁰

Place this behind its other half which begins on carta 23 of the present book and restore the division at car. 23, fac. 2, at the sign W, which finishes thus: "WORK wasted by him." Error of omission occurred at the letter because it was inserted on the back of another page.

38 [Continued]

W

We know, however, that an experienced master would not make errors like these, rather he would go by good rules, taking away so little at a time that he will guide his work well. Moreover, if the sculptor works in clay or wax, he can take away and add on, and when [his work] is finished it can readily be cast in bronze. This final operation results in the most permanent sculpture, since what

²⁰⁸ Kemp/Walker translates: "The second major consideration essential for the painter is . . ."

²⁰⁹ Ludwig, accepted by Pedretti, amends to: "Terza e' la prospettiva. . . ." While this interpolation is in keeping with the rhetorical exposition, it might be mentioned that the first and second "things" Leonardo describes also belong to the science of perspective in his considerations. There is a textual corruption at "prospettiva investigatione."

²¹⁰ This note by the scribe refers to Chapter 38, the second part of which is given in the same order as in the *Codex Urbinas*.

la scultura, inperoché quella che solo di marmo è soto-
 posta alla ruina, che non è il bronzo. Adonque, quella
 pittura fatta in rame, che si può com'è ditto della pit-
 tura, levare et porre à par al bronzo, che quando facevi
 quella di cera prima, si poteva anchora lei levare et porre.
 Se questa scoltura di bronzo, quella di rame e di vetro è
 eternissima. S'el bronzo rimane nero et bruno, questa pit-
 tura è piena di varij et vaghi colori et d'infinite vari-
 eta, della quale com'è di sopra. S'un volesse dire sola-
 mente della pittura fatta in tavola, di questo me acordarei
 anch'io con la scultura, dicendo così, come la pittura è
 più bella et di più fantasia e più copiosa, et la scul-
 tura più durabile ch'altro non ha. La scultura con poca fa-
 tica mostra quel che la pittura pare, cosa miracolosa a far
 parere palpabili le cose impalpabili, rilevate le cose
 piane, lontane le cose vicine. In effetto, la pittura è
 ornata d'infinite speculazzioni che la scultura non
 l'adopra.

46

De Pittura e Poesia

Per fingere parole la poesia supera la Pittura, et per
 fingere fatti la Pittura supera la poesia. Et quella
 proportion ch'è da fatti alle parole tal'è dalla Pittura
 alla essa poesia, perché i fatti sono subbietto del'occhio

15 bronzo. Adonque] ~, adonque OR; ~, Adonque ED "a" altered to "A"
 16 è ditto] tu dissi
 17 facevi quella dicere prima, so poteva anchora lei] faciessi prima l'opera di
 ciera ancor si poteva
 18 porre. Se] ~, se OR
 20 eternissima. Se'l] ~, s'el OR
 22 com'è] Ludwig adds "detto" after this; sopra. S'un] ~, s'un OR
 26 ha. La] ~, la OR
 29 vicine. In] ~, in OR
 30 la scultura non l'adopra] ED interlined above these words: "delle quali
 manca ha scoltura"

Ms. A, ff. 105r-104v

19 bronzo] bronzo e' eterna
 20 questa pittura] questa
 22 S'un] Esse tu
 23 me acordarei anch'io] son io contento dare sententia
 26 ch'altro] e altro; quella] qualche

46 3 poesia. Et] ~ ^ et OR
 5 alla], alla a OR; ad ED "alla a'" altered to "ad"

is only in marble is subject to ruin, which bronze is not. Therefore painting made on copper, where, as is said of painting, you can add on and take away, is the equal of bronze. When you first make the bronze in wax, you can also take away and add on. As [is] this sculpture in bronze, that [painting] in copper and glass is extremely eternal. If the bronze remains black and brown, the painting is filled with varied and charming colors and is of infinite variety, as we have [said] before. If one wants to speak only about painting done on panel, I agree with the sculptor about this, saying that just as painting is more beautiful and of greater *fantasia*²¹¹ and more copious, so sculpture is more durable than anything else. With little effort sculpture shows what painting appears [to show], the miraculous thing of making impalpable things appear palpable, giving relief to flat things, distance to things nearby. In effect, painting is embellished with infinite speculations which sculpture does not employ.

46. On Painting and Poetry

Poetry excels painting in feigning words, and painting excels poetry in feigning facts. There is the same proportion between facts and words as there is between painting and poetry, because facts are subjected to the eye and words are subjected to the ear. And so

²¹¹ Imagination. The equivalence of “*fantasia*,” “*imaginatione*,” and “*ingegno*” in Leonardo’s usage is discussed in CN 2 and Chapter Two of the text.

le parole subbieto dell'orecchio. Et così li sensi hano la medesima proportionione infra loro quale hano li loro obbietti infra sè medesimi. Et per questo giudico la pittura essere superiore alla poesia. Ma per non sapere li suoi operatori dire la sua ragione è restata lungho tempo senza advocati. Perché lui non parla, ma per sè si dimostra e termina ne' fatti. Et la poesia finisca in parole, co'le quali come briosa sè stessa lauda.

10

6 dell'orecchio. Et] ~ , et OR

8 medesimi. Et] ~ ^ et OR

9 poesia. Ma] ~ ^ ma OR

10 advocati. Perché] ~ , ^ OR

12 fatti. Et] ~ ^ et OR

13 lauda.] ED * the following text is given in a separate paragraph in the center of the page: "Questo capitolo di pittura et poesia, è ritrovato doppo s'aver scritto tutto 'l libro. Però mi pare starebbe bene s'ei seguissi dietro. cap. quale s[c]ientia è meccanica et quale no è meccanica, a car. 19. f 2. Piuotosto dietro al cap. arguitione, del poeta contra 'l pittore a ca. s A. f 2, ovvero dietro al seguente."

there is the same proportion between the senses as there is between their objects among themselves. Thus, I judge painting to be superior to poetry. Yet painting has remained without advocates for a long time, because its practitioners did not know how to argue its cause. For painting does not speak, but rather demonstrates itself in itself, and terminates in facts. And poetry ends in words, with which she praises herself as being brilliant.

[editor's note:]²¹²

[This chapter on painting and poetry was discovered after the whole book had been written, but it seems to me it would have a place after the chapter on which science is mechanical and which is not mechanical, car. 19, fol. 2. Or rather, before the chapter on the argumentation of the poet against the painter, at car. 24. fol. 2. or, truly, following it.]

²¹² Transcription to the following note is given in the Critical Apparatus.



Ill.20. Leonardo da Vinci. Storm breaking over a valley. c. 1500. Red chalk. Windsor, Royal Library W12409.

THE PARTE PRIMA

COMMENTARY NOTES

A Note about the Dates Cited in the Commentary

The reader is referred to the Consolidated Bibliography for full discussion of the dating of each document. My own autopsy of the Leonardo manuscripts has led me to accept most of the dating proposed by Carlo Pedretti; I differ from him, however, in a few cases. Where chronology bears directly on the *Parte Prima* texts, the evidence is discussed in the Commentary.

Parte Prima

In 1817 the *edition princeps* of the *Codex Vaticanus Urbinas 1270* was published in Rome. Its editor, Guglielmo Manzi, added the title "Paragone" to the *Parte Prima* (see Chapter One). The title "Paragone" was used in both previous English translations of the *Parte Prima*, the first by Irma Richter (1939 and 1949), who noted Manzi's addition of a modern title, and the second by A.P. McMahon (1956).

SECTION 1

Definitions of Painting, Chapters 1-12

The *Parte Prima* is organized according to subject matter into five subdivisions. Though Chapters 7 and 8 are both comparisons of the arts, in general, the first section defines painting as a science. It has been suggested that the first ten chapters are so well unified that they must have been compiled by Leonardo himself (Brizio, 1954; Pedretti, 1977). There is firm evidence, however, that this section contains writings of various dates that are not arranged in chronological order; the arrangement of the first ten chapters, like the rest of the *Parte Prima*, may be due to the sixteenth-century editor. Pedretti (1964, 125), following Brizio's textual analysis of the *Codex Urbinas* (1956), characterized these ten chapters as being "chronologically consistent" and, therefore, copied in the same sequence as they had in an original, lost source. Chapters 1 through 6 do seem to compose a single, consecutive argument definitely a late formulation (see Chapter Three). Chapter 7, however, is such a radical departure from the expository style of the first six chapters that it seems to originate in a different source, while Chapters 9 and 11 are

probably early formulations. Moreover, the last passage in the section, Chapter 12, is taken from *Ms. A*, ca. 1492, and like three other passages copied from the same extant source (Chapters 19, 38, and part of 31), it does not appear in the sequence of the original manuscript. Therefore, the arguments presented by Brizio and Pedretti should be applied with caution to the texts of the *Parte Prima*.

The section of the *Parte Prima* devoted to definitions of painting is appropriately placed as an introduction to a treatise. This arrangement is in line with other, contemporary prefaces (or proems), like Angelo Poliziano's *Panepistemon* (1490), that discuss the classification of the sciences. Poliziano, whose organization of the disciplines is reflected in other writings of the period, classified painting, sculpture, and architecture as mechanical sciences parallel to the poetic arts (see Müllner for other examples of proems; on defenses of poetry, Meltzoff; on humanist classificatory schemes Vasoli; and I. Maier on Poliziano's classification; further discussion at CN 28).

Traditionally, painting was classified among the mechanical arts as in Poliziano's scheme. An alternative classification was the ancient precedent of Pliny (*Nat. Hist.* 35.1 ff.) and Vitruvius (*De architectura* 1.1), who praise painting and architecture, respectively, as liberal arts. Alberti had referred painting to this scheme in his *De pictura/della Pittura* (1435/1436). Leonardo's precedents are also found in medieval discussions of the mechanical arts, such as in Hugh of St. Victor's *Didascalicon*. Hugh's discussion ultimately originates with Aristotle's classification of the productive sciences intended for making artificial things in the same manner as things formed by nature (*Metaphysics* 1034a34 ff.). Medieval writers like Dominicus Gundissalinus, Hugh of St. Victor, Robert Kildwardby, Roger Bacon, and Thomas Aquinas distinguished similarly between the theoretical and practical, or operative, sciences classified according to their ends (Crombie, 178; see further, Ovitt; Summers, 1987, 235ff.). But they did not rank painting and sculpture among the operative sciences, which included the disciplines of the trivium. On the other hand, fifteenth-century humanists like Lorenzo Valla, Poliziano, and Giorgio Valla, who continued to classify painting, sculpture and architecture as practical, mechanical arts necessary for life, conceived of the mechanical arts more the way Leonardo did, as occupying a place parallel to the operative arts in the hierarchy of human knowledge (Vasoli).

Modern editors of the *Codex Urbinas*, with the exception of Ludwig and Borzelli, have placed Chapter 2 with the other passages on the comparison of painting and poetry, in the second

section of the *Parte Prima*. However, as Pedretti notes (1964, 125), this rearrangement, rather than improving the organization of the *Parte Prima*, disrupts the initial argument. Chapter 2 also makes sense in its original position because the widely known classification of Thomas Aquinas ranks the sciences according to their relative degrees of rationality (see Chapter Two). Leonardo did not refer directly to Thomas Aquinas, but he directed Chapter 2 to the same issue concerning the relative degrees of demonstrability of poetry and mathematical science. Leonardo defined a new position for painting, as a science capable of achieving mathematical certainty and, therefore, superior to poetry, which rises only as high as “opinion.”

Arguments Leonardo formulated concerning pictorial relief can be understood only on the basis of a firm relative chronology of his optical investigations. A great deal has been written about the texts related to the opening chapters of the *Parte Prima*, particularly in connection with his theory of vision (see Ackerman, 1978; Kemp, 1977; and Strong, Introduction and 302–334). The proper relationship of these texts is an important issue awaiting resolution (see Chapter Three). Leonardo’s knowledge of the textual tradition of optics included Euclid and either Alhazen or sources based on him such as Pecham, Witelo, and Roger Bacon (see Lindberg, 1976, 154–168; Strong). Following in this tradition, Leonardo held that the process of vision can be demonstrated with mathematical certitude. In *Parte Prima*, Chapter 4, he illustrated this principle with a geometric demonstration, based on Alhazen’s theory that the process of vision can be represented schematically as a single eye located midway along a central axis linking the point of focus to the inner senses. Even though the geometric demonstration that accounts for the rectilinear (“punctiform”) action of light never appears in Leonardo’s notes (Lindberg, 1976, 156), the principle of punctiform analysis is fundamental to his optics. Chapter 4 is suggestive of Alhazen’s theory of vision. According to Leonardo, any point (of focus) on an object falls onto every point of a plane placed directly opposite that object. Related diagrams, such as the illustration of Pecham’s *radiosa piramida* in *Ms. A* (fol. 86 verso), are definite indications that Leonardo was acquainted with Alhazen’s theory by ca. 1490–1492.

Successive definitions of perspective in Leonardo’s writings are related to his expanding mathematical knowledge, which is the key to his evolving definitions of pictorial relief. In early writings, he rejected the use of artificial light to heighten contrast. In the late writings, on the other hand, Leonardo advised artists to manipulate oppositions of light and dark observed in nature, on the basis of

knowledge of their causes, selecting contrasting values in order to construct an artificial pictorial harmony (see Chapter Three). The definition of *disegno* in Chapter 6 of the *Parte Prima*, in which painting is completely identified with the science of *chiaro e scuro*, the study of light and shadow, is based on this late formulation.

The primary importance of the geometrical action of light to Leonardo's definition of painting is the analogy between mental images, painted images, and images reflected in mirrors (see Chapter Three). Connections based on the Augustinian conception of sight as the most noble sense capable of communicating the intelligible, underlie Chapter 7, whose point is that the usefulness of painting consists in its ability to communicate universally. But, by praising the scientific powers of the imagination, Leonardo also subverted medieval tradition, which refers the productive arts to divine knowledge gained by insight. There are significant departures from medieval discussions in Leonardo's argument. Medieval interpreters of Aristotle defined the function of the artist in terms of his ability to participate in the active power of the First Principle, or God. Leonardo's interpretation of experience, by contrast, is based on the imitation of natural appearances. Hugh of St. Victor defined art on its analogy to nature—both nature and the artist follow a reasoned course of action towards their ends—an analogy originating with Aristotle's definition of art as the capacity to make, involving a true course of reasoning that results in a product (*Nicomachean Ethics* 1139b24–1140b32). Leonardo's corollary argument, that the "universality" of painting results from its fidelity to nature, also recalls defenses of "ordinary" or "natural" language, by early humanists beginning with Petrarch, who distinguished between the respective benefits of eloquence and philosophy in order to establish a new system of the arts and sciences; he was followed by generations of humanists who defended the *studia humanitatis* on the ideal of eloquence joined to moral philosophy (Kristeller, 1956, 553–583). At the beginning of the fifteenth century, Leonardo Bruni and Coluccio Salutati introduced a related issue that also rests on the conviction that knowledge serves practical ends. Their arguments, defending the utility of the arts of disputation, are founded primarily on Cicero's definition of oratory as knowledge that can be known unaided and is capable of being judged by human nature. Cicero and his fifteenth-century humanist successors called this universal ability to judge the *sensus communis* (*De oratore* 1. 3. 12; compare Lorenzo Valla, *Disputationes Dialecticae*, 1. 17, see Seigel; on discourse as a humanist theme, see also N. Gilbert, 1971; and Marsh).

Leonardo's praise of *ingegno*, for example in Chapter 8, while it is not a discussion of rhetorical imitation, rests on a notion of "natural endowment" developed by Cicero. Distinguishing between the *ingenium* of mathematicians and that of orators, Cicero praised eloquence by claiming that while in mathematics every diligent student attains the "object of his desire," in oratory only the very best masters, with outstanding *ingenium*, ever succeed (*De oratore* 1.3.9–1.5.16). Early humanists capitalized on Cicero's defense of eloquence, directed against Plato's condemnation of all rhetoric as sophistry, to promote the status of their own profession. Thus, Leonardo coupled two ancient topoi well known in the fifteenth century when he defended the *ingegno* of painters on these grounds and connected the argument with the famous metaphor, Plato's conception in the *Timaeus*, of the created world as an image, picture, or mirror of the celestial one. Leonardo's argument has been related to precedents in Nicolas of Cusa and Ficino, both of whom combined the metaphor of nature as a reflection of the intelligible world with the argument that artists have the capacity to produce an image with human character by their inventive powers of *ingenium* (Cassirer; Chastel; Kristeller). However, a literary tradition had already been established by artists beginning with Cennini (*Il Libro dell'Arte*, cap. 1, ca. 1390); the majority of scholars now agree that there need not be any direct connection of texts (see Domandi, Introduction to Cassirer).

Cennini compared the painter's *scienza* and skill of hand "to discover things not seen, hiding themselves under the shadow of natural objects" with God's creation of heaven and earth. He identified the painter's *scienza* with his *fantasia*, or power of invention shared with poets. In the late fifteenth century, a similar unity of poetic and artistic imitation was posited by humanist writers like Poliziano, Giorgio Valla, and Pomponius Gauricus, all of whom named *grapheis* or *gramma*, meaning letter or mark, as the foundation of imitation. In 1504, Pomponius Gauricus, writing on sculpture, even identified *grapheis* with *disegno* as the "unity of art" (see Chastel and Klein, Introduction to Gauricus, *De sculptura*). Leonardo consistently characterized imitation in painting on similar grounds by comparing it to visible letters written on a page (see further CN 14).

Despite the superficial resemblance of Chapter 10 to the definition of painting given in the first six chapters, this passage is not an expository discussion, but an invective against philosophy. Leonardo's defense of painting in this chapter recalls humanist debates, beginning with Petrarch, on the greater practical value of

moral philosophy as opposed to natural philosophy, associated with their Scholastic rivals. Humanist defenses of eloquence promoted the value of ancient literature as a model for imitation, defined in ethical as well as stylistic terms (Gray). Debates in this tradition over the criteria used to judge history, for example, led to discussions of prudence that are particularly suggestive of Leonardo's argument also in Chapter 7. Leonardo similarly claimed that painting, a language capable of communicating the universal laws of nature to a universal audience, is founded on experience. At the beginning of the sixteenth century, Machiavelli's definition of history, as almost a "natural instinct" that presents phenomena to judgment by an act of comparison, is reminiscent of Leonardo's argument. Other writers championed the natural supremacy of the Tuscan language in similar terms, as being the best language for practical human discourse. The argument transposed to considerations of perspective is also directly associated with several writers Leonardo knew at the court of Milan, including Castiglione, Luca Pacioli; and to Jacopo de' Barbari (see Chapter Two).

When Leonardo defended painting as a demonstrable science, he may also have alluded to poetic methods of demonstration. For example, the last phrase of Chapter 12, although it recalls Alberti's *della Pittura* (see CN 19), defends painting for its ability to portray landscape, a subject that Alberti did not discuss in his treatise on painting. According to medieval literary theory, however, devices of *amplificatio* (such as *descriptio* and *interpretatio*) were used to create allegorical images of nature, called *ymaginatio*. *Descriptio* is a form of rhetorical demonstration associated with *ingenium* used in eulogies of praise and blame (Faral, 76 ff.; see further CN 12). As Priscian had defined this figure, it is "discourse that gathers together and presents that which is to be proven for observation" (Kelly, 54). Constructed on the principle of *comparatio*, or antithesis, such allegories, well established in medieval as well as humanist poetry and prose, present an alternative to propositional argumentation. Devising allegory in the form of a nondiscursive image (thought to emanate from the artist's *ingenium*), Bernard Silvestrius in the mid-twelfth century described Physis personified as being seated in Nature, dreaming and "deducing from the potentiality of Nature in a highly imaginary way" the composition of man (*Cosmographia*, chapters 8 and 9). Such rhetorical demonstrations taking the form of an allegorical description of nature suggest how Leonardo integrated scientific and literary sources of discussions of art when he defended painting for its unsurpassed ability to suggest images of nature filled with "visual discourses" (Chapter 6).

Chapter 9 begins with a definition of painting as natural philosophy because “philosophy treats increasing and decreasing motion.” The origin of Leonardo’s definition of painting as the study of motion owes a great deal to the analogy between the action of light and mechanical movement. The definition in this passage anticipates his later definitions of painting as a mathematical science; but there are noteworthy differences to suggest that the passage is an earlier formulation. Leonardo’s early definitions of painting derived from a model originating in the physical sciences are gradually superseded in his later writings by definitions that distinguish between the elements of geometry and physics, with painting defined as a science mediating between them (see Chapter Three). Chapter 9 is related to early writings that treat traditional problems of optics, like the movement of similitudes through the air—rephrased by Leonardo in connection with pictorial relief. It is tempting to connect the *Parte Prima* passage with Luca Pacioli’s statement of ca. 1498 that Leonardo had completed a treatise on motion: “moto locale e delle percussioni e pesi e de la forze tutte cioè pesi accidentali” (*De divina proportione* [Venice, 1509], fol. 1a). In Chapter 11, probably composed around the same time, Leonardo described the “gyrations” of sound waves as analogous to light rays. By integrating physiological and optical problems, Leonardo investigated issues left unsolved by his predecessors in both fields. This is probably an early formulation anticipating more definitive studies around 1508, like *Ms. D* where he compared visual images, perceived according to the laws of perspective, and “species” received by all the other senses, to argue that sight is the most certain sense.

Such discussions are the scientific counterpart to his polemical arguments on the hierarchy of the arts. While it would take a separate study to systematically determine the relationship of all of Leonardo’s comparisons of the senses to his comparisons of the arts, Chapter 11 and related passages in early notes are part of a larger group of writings that preceded the compilation of *Ms. A* (Brizio, 1954). In *Ms. A*, comparisons of the senses occur alongside comparisons of the arts. The theme of the five senses discussed in reference to perspective reappears, just as prominently, in *Madrid Codex II*, as part of the definition of painting. Comparisons of the senses recur in late anatomical writings (such as *Anatomical Ms. C IV*, fol. 18 recto [W. 11951], 1513), on the physiology of the sense organs. Aristotle laid the basis for physiological discussions of the senses on a structural analogy (*De sensu et sensato* 439–442) by hypothesizing that organs of sense judge qualities according to a

system of contrary values in the same way that the eye judges light—in ratios perceived as color. Writings on the comparison of the senses were transmitted by a vast commentary tradition, available to Leonardo in medieval encyclopedias, commentaries on the *De sensu* and the *De anima*, and optical as well as medical writings. Certain Scholastic commentaries of the late fourteenth century initiated a controversy concerning whether Aristotle regarded sense as an active or passive virtue, focusing on the definition of “species” (Marshall, 1982). Leonardo took on related problems when he investigated the nature of the *virtù visiva*, or active agent of vision.

Johannes de Ketham, *Fasciculus medicine* (Venice, 1493), a book identified from the contents of Leonardo’s library listed in *Madrid Codex II* (fol. 3 recto; see Reti, 1974, 3:92, n. 2), suggests that Leonardo’s account of the inner senses is not as revolutionary as many scholars have believed, but rather derives from Mondino’s *Anathomia*, a dissection manual of ca. 1316 that gives a simplified version of Avicenna’s treatment of the inner senses very similar to Leonardo’s (see Chapter 2 and note *sub numero*). We can follow Leonardo’s argument on the basis of Avicenna’s discussion of anatomy, in turn based on Galen (on medieval faculty psychology, see Harvey). Leonardo, like Mondino, reduced Avicenna’s scheme of the inner senses so that the *sensus communis* corresponds to the seat of judgment in the central ventricle, Avicenna’s *imaginativa*. In Leonardo’s use, the terms *imaginatione*, *imaginativa*, and *fantasia* seem to be more or less interchangeable with the *sensus communis*. The term *impressiva* (or *imprensiva*, often abbreviated *impresiva* in his own notes) seems to be an original coinage (possibly derived from impetus mechanics) that corresponds roughly with Avicenna’s *imaginatio* (see CN 2). *Corpo ombroso*, a term that has caused problems of interpretation in the past, derives directly from optical writings (see Pedretti, 1977, commentary to R. 63), as does the word *similitudine*, meaning image, one of eleven more or less equivalent terms in use at least since Roger Bacon (*De mult. spec.* I.1.42–69; see Lindberg, 1983, lvii; further discussion at CN 45). Leonardo used terminology in line with that of other late fifteenth-century writers like Gianfrancesco Pico della Mirandola. Dante’s description (*Convivio*, Book II) of how the mind processes sense impressions is likely to have been an early source of Leonardo’s terminology (Kemp, 1972; 1977).

In Chapter 8, Leonardo argues that nature endows the painter with the power to make a “simulacrum” that God loves and people adore “as if in their minds such a God were alive and present.” He

refers the painter's "virtù" to *imitatio* in a metaphysical rather than a scientific sense. Leonardo's notion of the artist as a creator is indebted to the Augustinian distinction between contemplative actions that join the artist's intellect with its object, and the acts of God, who alone creates *ex nihilo* (Augustine, *De Trinitate* 3.9; Thomas Aquinas, *Summa Theol.* Ia, qu. 45, art. 5; see CN8). In agreement with Scholastic ideas, Leonardo defined painting as the imitation of natural similitudes on the foundation of the neo-Pythagorean notion that the structure of beauty perceived by sight is accommodated to the structure of the soul, and "whatever delights the soul partakes in number" (Augustine, *De vera religione*, Cap. 30, sec. 56; see further, CN 21). In Chapter 8 and elsewhere Leonardo argues that painting is a mathematical science, and therefore concerned with that which is eternal ("substantie"). Leonardo, however, never articulated a theory of divine illumination; on the contrary, he treated "similitudes" as concrete, physical phenomena. However, unlike Bonaventure, he discusses similitudes in terms of their "accidental" and therefore perishable properties (see CN 26). He believed, along with certain later Scholastic writers (including those, like Nicole Oresme, who argued over the nature of species), that certainty can be obtained by sense perception alone (Tachau; Summers, 1987, 157–164). However, on the basis of the same medieval tradition that defines "nobility" as the union of the artist's active power with the "first principle," Leonardo exalted, even beyond the claims of medieval writers, painted imitation over the other productive arts, which made inferior "copies" like books and bronze casts. In doing so, he approached his immediate artistic predecessors like Lorenzo Ghiberti and Piero della Francesca and contemporaries like Poliziano, who also defined painting as a science subalternate to mathematics (Leonardo's definition of painting on the model of a *scientia media* is discussed in Chapter Two).

CN 1

Despite the repetitious language of Leonardo's definitions of painting, the first passage of the *Parte Prima* is unique in the corpus of his writings. Together with Chapters 2 to 6, it forms a consecutive argument beginning from the first principles of mathematics and concluding with definitions of the elements of painting derived from demonstrated principles (see Chapter Three).

The definition of painting as a mathematical science is the subject of Chapter 1, and, although the discussion is expository, it

has polemical connotations. Traditionally painting was classified among the mechanical arts. Alberti had referred to painting as a liberal art, following Pliny's ancient precedent, in his treatise on painting of 1435. The hierarchy of the sciences Leonardo sets out is based on a generally Aristotelian classification of the mathematical sciences into the continuous and discontinuous quantities headed by geometry and arithmetic, a scheme that originates with Hugh of St. Victor, based on the well-known classification of the quadrivium and trivium, usually credited to Varro and popularized by Martianus Capella (see Marietan; Wingate; Stahl, introduction to Capella). Leonardo has inserted painting at the top of this hierarchy, following geometry and preceding astronomy (see Chapter 6, on astronomy). This defines painting on the model of a *scientia media*, that is, a science which is both mathematical and physical (see Chapter Three). Leonardo's argument is closest to that of Luca Pacioli, who even cited Leonardo's mastery of perspective in painting when he argued that perspective and music are equivalent because they both concern proportion (compare *Parte Prima*, Chapter 32). Pacioli instructed Leonardo in Euclidean geometry, and it is likely that as early as 1496, when he arrived at the Sforza Court, he introduced Leonardo to Scholastic writings on the classification of the sciences. Perhaps Leonardo was also influenced by other Scholastics at court while employed by Duke Lodovico from 1481 to 1499 (on these personalities, see Malaguzzi-Valeri; Duhem; Garin, 1970; Kemp, 1981; on Pacioli's teaching, see Marinoni, 1960). Leonardo may have initially come into contact with similar ideas through a vernacular tradition of optical or anatomical writings circulating among artists in Florence, which may have included handbooks on practical geometry (on vernacular texts, see Federici-Vescovini, 1980; on *abbachi* specifically, van Egmond; on anatomical writings, see reference to Galen below).

The form of Leonardo's definitions of painting as a science founded on both mathematics and experience can be traced specifically to his knowledge of Pecham's *Perspectiva communis* by ca. 1489–1492, but he developed his early definition of painting in an independent direction after he began to study Euclidean geometry around 1497. During subsequent studies ca. 1502–1505, he developed a new definition of painting as a mathematical science in which he distinguished between the mathematical and physical elements of perspective (see Chapter Three). Three drafts for a definition of painting as a mathematical science in *Madrid Codex II* (folios 62bis/r, 66r, and 67v), ca. 1503–1505, are the most direct

precedents of Chapter 1. These passages define perspective similarly as a mathematical science belonging to geometry which investigates continuous quantities. The *Madrid Codex II* passages closely resemble Pacioli's arguments for perspective as a liberal art compared to music (*Compendium de divine proportione*, complete by 1498; see also CNs 3–6, 31). This opening passage of the *Parte Prima* is Leonardo's most extensive articulation of his late views (Pedretti, 1964, 121–128). Chapter 1 is usually related to a cluster of earlier passages (centered around CA 117 and 119 and including the translation from Pecham on CA 203r–a), dating around 1490–1492, known as the “Proemio Series.” Many other notes have been related to these passages since Jean Paul Richter first identified them by this title (see Pedretti, 1977, commentary to R. 9–13, 21, 60; Brizio, 1954; CN 2 on problems of dating). Similarities have also been recognized with passages in the *Codex Arundel* and *Ms. G* (Pedretti, 1964, 125) and *Madrid Codex II* (Pedretti, 1977, Commentary to R. 42). However, Chapter 1 must be later than the *Madrid Codex* or related *Codex Arundel* texts, because those definitions do not yet distinguish clearly between mathematical and physical entities.

With the exception of the translation of Pecham's “Proemio” (R. 13), the invective form of the arguments known as the “Proemio Series” differs from that of Chapter 1; however, two of the “Proemios” (R. 12 and R. 21) are related by content to another passage in the *Parte Prima*, Chapter 33, which could be an earlier draft of Chapters 1–6, although its argumentation is dialectical rather than demonstrative.

CN 2

Chapter 1 defined painting as a science belonging to geometry and certified by experience, while Chapter 2 explains how poetry is not such a science. The argument is continued in Chapter 3, which states the mathematical principles of painting, and Chapter 4, a geometric demonstration. Thus Chapter 2 continues the line of reasoning from Chapter 1, as the words “esempio” and “differenza” in the title suggest.

The form in which Leonardo states his comparison of painting and poetry is typical of his propositional arguments derived from mathematical demonstration. The argument is set out as an equation between two ratios and arranged like a problem of practical geometry solved by the rule of proportionality. The formula used to find an unknown fourth term was commonly called the “Rule of

Three” (see Marinoni, 1964, on Leonardo’s rule of proportionality; for an introduction to the “Rule” with reference to art, see Baxandall, 1972).

Leonardo’s comparison of painting and poetry to a body and its shadow recalls Augustine’s neoplatonic metaphor that sense is to memory as a body is to its likeness, in *De Trinitate* (11.4.7). Similar analogies were repeated in many variations in later Renaissance polemics on painting and sculpture; the most famous are depreciations of painting by Cellini and Michelangelo (reprinted in *Scritti*, 3: 522). Augustine’s metaphor, like Leonardo’s, is based on the theory that memory retains images experienced in the act of vision: “from which the eye of the mind (*acies animi*) is formed.” Leonardo’s simile is a direct inversion of Augustine’s description of divine insight, however, in which he contends that images directly sensed by sight are superior to images that occur only internally.

Leonardo’s equation between sight and the imagination may be based directly on Johannes de Ketham, *Fasciculus medicine*, Venice, 1493 (a second direct reference occurs on W. 12597, ca. 1493–1494, see Keele/Pedretti; Ackerman, 1978), which includes the following description of the inner senses from Mondino’s *Anathomia* (Todd, whose translation is cited here):

phantasia, which retains the appearance received by the particular senses, is located in the anterior angle. *Imaginatione*, which apprehends those appearances received by *phantasia*, is in the posterior angle; it apprehends them by composing and dividing. . . . In the middle is the *sensus communis*, which apprehends appearances carried from the particular senses, and so, as you will see, the sensitive parts end at this place like rivers in a fountain. . . . All these things are in accordance with the opinion of Avicenna, *De virtutibus animalibus*, although as I declare elsewhere, according to the opinion of Aristotle and Galen, there is only the *sensus communis* which is variously called *phantasia* and *imaginatione*.

Leonardo’s understanding of the internal senses is probably also indebted to Dante’s description of how the mind processes sense impressions, in Book 2 of the *Convivio* (Kemp, 1972, 1977). Passages as late as CA 184 v–c, ca. 1515, still recall Dante’s text (see *Convivio* [2, 10]; on 1, 368, the editors cite Dante’s sources in Avicenna and Aquinas). Among Leonardo’s earliest discussions of the inner senses are *Ms. B*, fols. 31r–33v (R. 68 and R. 506), ca. 1486–1490, and the related CA 181v (R. 493), which apparently derive from Dante’s description of the internal senses (a line in *Ms. A*, fol. 112v, ca. 1490–1492, cites Dante’s *Convivio*, Book 4, Canzone 3.4, lines 52–53; see Chastel, 128; Kemp, 1977, 131; on Dante’s optics, see Parronchi, 35).

We can follow Leonardo's argument mainly on the basis of Avicenna's terminology. Leonardo means that the eye receives the image (*similitudo*) of an object (*corpo ombroso*) which the sensate power of sight (*virtù visiva*) passes to the mirror-like *impressiva*, where the *imaginazione* "sees" it. In the case of poetry, however, there is no visual image, only a verbal description that is like the "shadow" of an object (because words call up images stored in the memory to the *imaginazione*: see CN 15). Therefore:

the object = painting
its shadow poetry

The Latin term *corpo*, qualified by words such as *luminoso*, *opaquo*, and *umbroso*, was used by a number of optical writers besides Pecham and translated into Italian by others, including Ghiberti (*Commentarii*, 3, fol. 19v, whose source is probably an Italian translation of Alhazen, Vatican 4595, fol. 51rb [Federici-Vescovini, 1980, 133]). The term *corpo ombroso* appears in *Ms. A*, fol. 86v, in a discussion based on Pecham's *Perspectiva communis* (as in Proposition I.21{19}–23{21}). Leonardo defines *corpo ombroso* in two statements in the lost portion of *Ms. A* transcribed by G.B. Venturi and also compiled in the *Codex Urbinas* (ed. McMahon, nn. 579 and 586; for this history, see *Ms. A*, ed. Corbeau/de Toni, 1: xi–xiii). The text of McMahon 579 clarifies Chapter 2: "shadow derives from two things dissimilar from one another of which one is corporeal and the other spiritual; the *corpo ombroso* is corporeal, the light (*lume*) is spiritual. And thus light and body are the causes of shadow." In late writings Leonardo treats shadow as a non-corporeal element: *corpo ombroso* is defined simply as an "opaque body" as opposed to a transparent one (see CA 253, ca. 1508; see further CN 45).

Leonardo's term *impressiva*, which seems to be an original coinage (Ackerman, 1978, 139) may derive from Avicenna's *comprehensiva*, or from impetus mechanics. It could also be an adaptation of the Scholastic term *apprehensiva* used by Albertus Magnus to denote the combined activity of the external senses and the common sense in the front ventricle of the brain (on Albertus, see Steneck). Cristoforo Landino used the term *apprensiva*, meaning *phantasia* or *senso comune*, which is perhaps closest to Leonardo's terminology (*Comento sopra La Comedia*, Purgatorio 17; I thank Mary Pardo for calling both Landino and Albertus to my attention). Some hint of its origins may be glimpsed in *Madrid Codex II*, fol. 27r, where the variant form "impressiva" occurs together with the word "inpressioni." The optical term "impressiva" apparently refers to the

impact of species on a surface, a usage that is in line with definitions of impetus in mechanical theory. Leonardo also used the late Scholastic term *virtus impressiva* to designate impetus or motive force (in discussions of the objects of the senses the term occurs frequently: CA 135 v-a and b; CA 270 r-c; CA 332 v-a; CA 360 r-a and c; *Ms. G*, fol. 73r; on the Scholastic term, see Moody). In Leonardo's usage, the *impressiva* also suggests Dante's analogy that sense impressions "discourse" through the optic nerve and terminate in a surface almost like a "leaded glass mirror," in which images appear of the forms of visible objects. The forms perceived are in a continual process of "transmutation," involving figure, size, number, movement, and rest in a *discorso* (*Convivio*, Book 2, 10; parallels between Dante's *discorso* and Leonardo's definition of painting are discussed further in CN 6; on medieval faculty psychology, see Harvey; Summers, 1987).

Chapter 2 makes sense only with reference to the figurative meaning of "shadow" as image (see discussion at CNs 14 and 24). Macrobius classified types of fiction when he categorized "true" and "false" dreams arising in the imagination (*Commentary on the Dream of Scipio*, 3.9-10). The type of fiction which rests on "a solid foundation of truth" is appropriate to philosophical discourse and, accordingly, sensible descriptions make ideas accessible through verbal images that require interpretation. Medieval writers often compare descriptions (such as allegorical personifications called "portraits") to painted images. They prescribe rhetorical devices (such as *interpretatio*) to achieve variety in nondiscursive verbal images (see Kelly; Kolve).

CN 3-6

Chapters 1 through 6 establish painting in an Aristotelian scheme of the mathematical sciences (see CN 1). Chapters 3 through 6 define the "first principles" of the sciences which pertain to painting. This definition can be referred ultimately to Aristotle's definition of demonstration in the *Posterior Analytics* as knowledge that can be demonstrated in a particular science by using the principles of the more universal science to which it belongs.

In the first diagram in Chapter 4 Leonardo demonstrates how light acts mechanistically by traveling in a straight line along a central axis to a reflecting plane surface inside the eye (presumably like the *impressiva*, although Leonardo does not supply an explanation). By the similarity of triangles, objects outside the eye are proportional to the mental image (or similitude of these objects)

received inside the eye (based on Alhazen, *De Aspectibus* 4.14, but the same proof is given by Witelo, Pecham, Bacon, and others: see Strong, 319 ff.). The same demonstration occurs many times in his writings, for example in *Ms. A*, fol. 93r, ca. 1492, where the text states that "all bodies extend similitudes infinitely, all in all, all in the parts." This wording is reminiscent of al-Kindi (see further, Bacon, ed. Lindberg, Introduction), although, like other passages in *Ms. A* (such as folio 86v, illustrating Pecham's *radiosa piramida*), it may derive more directly from Pecham.

In his later investigations, first in *Ms. D*, ca. 1508, Leonardo revised his earlier view by distinguishing sharply between the physical nature of the eye and the spiritual nature of light and mathematical schemata. It may be that Chapter 4, a geometric demonstration of vision that follows Alhazen's reduction of sight to a single eye, is earlier than these formulations. However, it may also be that the explanation in Chapter 4 is intended only as a didactic scheme and is simplified for these reasons, since the attendant definition of perspective as a science which belongs to painting, in Chapters 3 and 6, resembles late discussions in *Mss. E* and *G* most closely (Pedretti, 1964, 128).

As he tested Alhazen's theory of vision, Leonardo applied the geometric principles involved in the action of light that results in lustre, which he defined as the greatest beauty of color, to a number of related pictorial concerns (see Chapter Three). These considerations, initially articulated in *Ms. A* and perhaps even earlier, underlie the definition of *disegno* given in Chapter 6. There are significant differences between the definitions in *Ms. A* (1490-1492) and the opening chapters of the *Parte Prima* that must be due to Leonardo's intervening studies. In *Ms. A* there is no categorical distinction between the pictorial representation of optical phenomena and the formal study of optics. The categories in *Ms. A* do not name the study of the "diminution" of bodies and color, even though the subject is discussed in the body of text. Nor is the study of the boundaries of forms, so important to later considerations, mentioned in the formal definitions, nor the distinction between mathematical and graphic lines corresponding to visible elements in nature. These are important features of the *Parte Prima* definition.

In Chapter 6 he states that *disegno* represents the main lines (*lineamenti*) of bodies and the boundaries (*termini*) of bodies as cognition of them is gradually lost at increasing distances from the eye. Leonardo distinguishes *chiaro e scuro* from "simple perspective," the study of "visual lines" as in astronomy, which is not

concerned with visible things like the surfaces of bodies covered by light and shadow. Painting, on the other hand, is concerned with feigning these surfaces (Chapter 3). Painting imitates actual relief, for it “sculpts” flat surfaces by feigning the shadows, that is, the parts that appear depressed or incised (Chapter 5; compare Chapter 45 for a polemic against sculpture based on this distinction).

CN 7

The central point of this argument is that painting is superior to words because it presents the similitudes of actual objects to the imagination. This defense of painting as the imitation of natural appearances is based on the geometry of light and the function of the inner senses. Unlike the previous chapters, it is an argument from final cause (“la pittura ha il suo fine . . .”), whereas the first six chapters argue from formal cause, that is, first principles (compare Chapter 1: “Scientia . . . ha origine da suoi ultimi principij”).

Leonardo’s praise of the painter in terms of the “usefulness” of his “products,” which imitate nature, suggests medieval definitions of painting as a mechanical art. His argument generally calls to mind the medieval view that the didactic function of images is to communicate the intelligible. In the mid-fifteenth century, however, Alberti described painting in terms somewhat reminiscent of other statements in Chapter 7: according to Alberti, “nature herself seems to delight in painting,” she is the “marvelous artificer” of “all manner of compositions,” for which purpose ancient artists labored to discover the laws upon which she acts in the production of her works (*De re aedificatoria*, [1486], ed. Rykwert, 195; see Bialostocki, 1963; Leonardo owned a copy of Alberti’s treatise, see Zubov, 1960). Marsilio Ficino also compared the “fabrications” of art to the procedures of nature in Aristotelian terms (*Theologica Platonica*, I.iv), and Leonardo’s close associate, the artist Francesco di Giorgio Martini, referred to painting as a “factible” science (see Boskovitz). This Aristotelian Scholastic framework for discussing imitation was continued in the next century by artists including Michelangelo, followed by Vincenzo Danti, and by humanists such as Vincenzo Borghini and Benedetto Varchi (see Chapter Four).

Leonardo’s argument that the “universality” of painting results from its fidelity to nature seems to echo early humanist writers on the “splendor of eloquence,” particularly the defense of “ordinary” or “natural language,” which grew out of debates on the ranking of the disciplines as fields of human knowledge (see Chapter Two).

Debates on the usefulness of history, together with humanist definitions of painting as *istoria*, are a particularly suggestive precedent to Leonardo's argument that painting communicates universally (on the usefulness of history, see Pincin).

The concluding argument in this chapter presents an anecdote praising paradoxical illusion and artistic virtuosity. Many variations of this story are recorded since the late fourth century B.C.; the account of the dog who recognizes the portrait of his master, of which a variation is repeated in Chapter 14 along with an allusion to Zeuxis's grapes, has been identified in the *Greek Anthology* (9.604; compare Pliny, *Hist. nat.*, 35.65; on the subject of artistic *topoi*, see Kris and Kurz, 63, for this reference).

CN 8

Leonardo's remarkably modern-sounding defense of painting—that it alone bears inimitable products—actually has a medieval precedent. Nature has a special competence for making copies based on divine archetypes, according to Alain de Lille (*Anticlaudian* 7.74 ff.), and many other neoplatonizing writers (see Cahn, 27). The word “sustantie,” as used in this argument, has caused problems for past translators (see Reader's Note). The grammatical structure of the sentence is ambivalent, but it would seem that Leonardo generally follows Aristotle (compare *Metaphysics* 1073b4 ff. distinguishing astronomy, which treats of substance) in saying that sciences treat of substances, which are perceptible, eternal, and prior, and therefore not subject to the continual process of generation and corruption.

Leonardo's argument that the artist as a creator is indebted not only to the Augustinian idea that God alone creates *ex nihilo* (Augustine, *De Trinitate* 3.9; see Panofsky, 1963, 173), and also, in another sense, to Scholastic terminology used by Bonaventure and others to the effect that similitudes are “offspring” by which God communicates his likeness in “multiplication of itself” (compare Adam Pulchrae Muliers [formerly attributed to Witelo], *De intelligentis*, 31, cited by Lindberg, 1972, ix–x). By Scholastic definitions of nobility and perfection, “any divine and noble attribute is found in higher degree in the first intelligible object with which it is in contact” (Thomas Aquinas, *Comm. Metaphysics*, XII.L8: C2543). According to Aquinas, something perfectible is receptive of a perfection, so material substances receive likenesses (similitudes) of the intelligible by way of the sensory powers. Aquinas also compares intelligible forms to the mental images (fantastic forms) used by the mathematician and by the artist in making things: the

similitudes conceived from intellective things are similar to manifestations generated by art (*Comm. Metaphysics*, VII.L6: C1381–1416). With reference to the mechanical arts Bonaventure categorized these Scholastic ideas into a hierarchical process of “illumination” in four stages, beginning with the “external light” of mechanical art. In the mechanical arts, one considers the product, the fruit of the work, or the skill of the artist (*De reductione artium ad theologiam*, 1.11), which proceeds from the artificer according to a similitude existing in his mind in the same way as God produces “creatures” bearing his vestige and his image “so that through knowledge they might become like unto Him” (1.10–12; “speech” is also such a likeness [*species*], 1.18).

Chapter 8, therefore, conflates two concepts of painting: one, which originated with Bonaventure and Thomas Aquinas, that the painter, a mechanical artist, works in the manner of *deus creator*; the other, which goes beyond these medieval sources to contemporary optical theory, that painting is a theoretical science. The nobility of the painter derives from the first line of reasoning, the nobility of his art stands on the second.

CN 9

This chapter begins with a definition of painting related to Chapters 3–6. The meaning of the reference to “the above proposition” is unknown. From the internal evidence it is difficult to identify this chapter securely in the chronology of Leonardo’s writings, although the language suggests a date around 1497, when Leonardo first turned to the study of Euclidean geometry (on Leonardo’s program of self-education in the works of Euclid, and Archimedes on the commensurability of the circle, see M. Kemp, 1981, 248). The wording of the definition in Chapter 9 most closely resembles McMahon n.100 (*Codex Urbinas*, fol. 50r), of which the first paragraph states that there are five parts of painting of which the fifth is “proximity and distance, or increase and diminution with distance, which are the two perspectives . . .,” followed by a second paragraph which states that painting is divided into two “principal parts,” the lines (*lineamenti*) that surround the figures of feigned bodies and shadow, “but this *disegno*” is so excellent that it commands the sculptor and all the manual arts. This definition of the elements of painting, with reference to *disegno* as sculpted relief, sounds like an earlier formulation of Chapters 3–6 of the *Parte Prima* (earlier, since there is no mention of “termini”), while it is also related to Chapter 9, which describes the concern of perspective with “increase and decrease.” However, the original of

McMahon n.100 is also unknown and, therefore, dating cannot be based on this passage.

Circumstantial evidence suggests that Chapter 9 was composed when Leonardo studied Aristotle's *Physics*, perhaps indirectly in commentaries, around 1497. Leonardo had articulated the connection between optics, which is the study of the temporal movement of light in straight lines, and general theories of motion as early as 1489 (see Appendix 2). The evidence also suggests that Chapter 9 might document an intermediate stage in Leonardo's definitions of painting, when he turned to Aristotle's general definition of movement to define the laws of pictorial perspective. With the exception of the definition of "philosophy" as the study of motion, most of Chapter 9 is foreshadowed in passages on fols. 98r–100r of *Ms. A*, ca. 1492, which form part of a discussion of pictorial *relievo* continuing from folio 81r to the end of the manuscript (fol. 114v).

The singular feature of the definition of perspective in Chapter 9, echoed in McMahon n.100, is the characterization of perspective as extending to the "increase and decrease" (*accrecimento et decrescimento*) of bodies and colors, which makes painting philosophy because "philosophy treats increasing and decreasing motion." Aristotle defined physics as a mathematical discipline concerned with things which do not exist apart from matter (*Physics* 193b31 ff.). The present passage specifically recalls Aristotle at the beginning of Book 3 of the *Physics*, where he states that "nature (*phusis*) is defined as the principle of motion and change" and motion is defined as belonging to "the class of things which are continuous"; motion is "what can be increased and its opposite what can be decreased" (*Physics* 200a12, 17, and 201a10–14). There are direct references to Aristotle's *Physics* by Leonardo, in two notes of ca. 1495–1500, evidence which suggests that the present chapter is of similar date (see further, Appendix 2).

Chapter 9 is a rather disjointed passage, but it makes more sense in the context of the discussions in *Ms. A*. How perspective, motion, and philosophy are related is explained in large part by reference to Aristotle and to three passages in *Ms. A*, one of which defines perspective, while another compares the "natural philosophy" of the painter with the "moral philosophy" of the poet and the third is a diatribe on the subject of painting as philosophy (included in Chapter 12 of the *Parte Prima*). Leonardo's concern with perspective, as stated in Chapter 9, develops the same claim about painting further than *Ms. A* by asserting that painting is philosophy because it concerns motion as the "increase and decrease" of surfaces. In later writings, such as *Madrid Codex II*, ca. 1503–1505, Leonardo

developed this connection between perspective and motion by defining painting as the study of the “continuous” because it belongs to the mathematical science of geometry (see CN 1).

Chapter 9 may not be immediately related to the unidentified book on painting and movement cited by Pacioli, *De divina proportione* (Venice, 1509), but it is probably an early formulation of the unifying principle of continuous motion, central to the *Parte Prima* arguments that painting is philosophy because imitated relief demonstrates the laws of optics. Leonardo’s studies in mathematics beginning around 1496 led to major revisions in his definition of pictorial perspective (see CNs 1–6), and the connections can be extended to his study of human movement. There is ample manuscript evidence to suggest how Leonardo applied the study of continuous motion in optics to the representation of figurative movement. Notably early is CA 270 r–c, the draft of a letter datable 1488–1490 (Pedretti, *Comm. to Codex Atlanticus*, 730R), in which Leonardo refers to Vitruvius in terms repeated by Pacioli (see Chapter Two). It has been argued that Leonardo’s joint interest in Euclidean geometry and the Vitruvian canon (based on Polyclitus’ system of continuous proportion), as attested by the ca. 1496 drawing of the “Vitruvian man” now in Venice, developed in direct connection with stereometric projections planned for Pacioli’s *De divina proportione* (I. Richter, cited in Pedretti, *Commentary* 1: 66; although it does not follow that his interest is, therefore, independent of medieval geometric methods of mensuration as Pedretti claims). Pacioli also states, as is mentioned above, that Leonardo had completed a treatise on “moto locale e delle percussioni e pesi e de le forze tutte cioe’ pesi accidentali” (*De divina proportione*, fol. 1a).

The treatment of figurative movement with respect to three principal viewpoints, at the center of a spherical field of vision, is a Euclidean conception described by Vitruvius and worked out by Leonardo’s followers (see Pedretti, 1977, 1: 65 ff., for the arguments advanced by I. Richter and others, and on the connection between Leonardo’s studies and the *Codex Huygens*; and Panofsky, 1940, 70, noting the appearance of these ideas in agreement with Leonardo’s studies). In connection with his treatment of figurative movement, Leonardo’s discussion of composite motion as “moto actionale,” which is infinite, continuous, and distinct from local movement (change of place) (*Codex Urbinas*, ed. McMahon n.355 [ca. 1505–1510 according to Pedretti’s dating], repeated in the *Codex Huygens*), is a mature statement of central ideas apparent since his earliest drawings of Madonnas. These ideas were already well advanced by ca. 1487–1490, as is attested by the study of mechanical movement in

Ms. B, which includes a page on the “proportion of the human arts” (Pedretti, 1978, 36) along with reconstructions of Attic vases after Alberti’s treatise on architecture, based on Vitruvius (Zubov, 1960, 11, n. 2).

In seeking proportional relationships between commensurable and incommensurable figures, a subject he repeatedly identified with “divine harmony” (a central theme in his comparisons of painting and music), Leonardo joined his interests in the mechanics of human movement with geometrical methods of transforming volumes. Apparently, the earliest such problem of commensurability that Leonardo established geometrically, by inscribing a figure in a circle, is the famous drawing in Venice, which is taken from Vitruvius and also dates from ca. 1496. Related studies later led him to Giorgio Valla’s *De expetendis et fugiendis rebus*, 1501, and other sources, and involved Pacioli’s participation (see McCabe, 45, on the Delian problem of commensurability, and 110, citing CA 318 r–b, ca. 1496). McCabe suggests that by 1496 Leonardo was not satisfied with mechanical, nongeometric methods and thus turned to the study of geometric proportion (see also Marinoni, 1964; Clagett, 1978).

CN 10

This passage is an invective against philosophy. Using the rhetorical technique of paradox (described by Malloch; Colie), the argument turns on different senses of the word “virtù.” Rhetorical paradox is frequently used in medieval poetic contests called *tenzoni* or *contrasti*, and other *Parte Prima* passages tease the reader with questions drawn directly from this tradition (see Chapter Two; CN 16). The phrase, “the eye is less deceived,” used again in the next passage, here should be interpreted to mean that the judgment of the eye is less deceived than deliberations on man’s “proprie virtù.” It is not possible to determine what man’s “individual powers” (*proprie virtù*) are from the context: they could be moral or intellectual virtues, or possibly a “faculty” in the sense that the soul is a sensible and intellectual “virtù.” The general sense of the contrast is that painting is concerned with the visible, while philosophy is concerned with things less knowable, i.e., the invisible (compare Chapter 33).

Whatever Leonardo meant by “proprie virtù,” he definitely used it to draw a contrast to the physical or “natural” sense, concerned with the power of an action, such as the *virtù visiva* which comes into contact with rays of light carrying the similitudes of objects (see CN

2). Different uses of the word *virtù* existed side by side in Renaissance writings and were not always clearly distinguished (on Renaissance meanings of the word “virtù,” see Seigel, 1973). There was, however, an established literary tradition for using the language of physics to refer metaphorically to moral action, as in Dante’s *Convivio*, which Leonardo knew by ca. 1492 (see CN 2).

In Leonardo’s view, following the tradition of Alhazen’s optical theory, sensitive judgment can be free of error, and this is the central issue in this passage. In this respect, Leonardo followed optical writers associated with the School of Paris like Biagio Pelacani, who accepted Alhazen’s materialist explanation of the act of vision (Federici-Vescovini, 1965). The epistemological issue debated by Scholastic writers, of whether information received from the senses can be ascertained without fallibility, seems never to have arisen in Leonardo’s considerations (on Scholastic issues, see Kretzmann; Tachau; Chapter Two; CN 33). Chapter 10 implies that painting, like the mathematical sciences, leads to certain knowledge of true and false. The wording resembles CA 203 v–a, ca. 1490, as does Chapter 11, as well as the debate between painter and poet in *Ms. A* (Chapter 19), where Leonardo also defends painting as natural philosophy in contrast to the moral philosophy of the poet. Its similarity to the passage in *Ms. A* and CA 203 v–a indicates that Chapter 10 was also composed around 1490–1492.

CN 11

The discussion of the “species” of the five senses in Chapter 11 is most closely related to writings around 1490, especially CA 90 r–b, where Leonardo defines the common sense as the “instrument” which judges species or “similitudes” given to it by the five senses (see further CN 23). The passage is also related to CA 203 v–a, where Leonardo outlines a general study of motion that includes a brief discussion of the “movements” of the five senses (see CN 9); and CA 270 v–c, where he states that the “similitudes” of the eye surpass those of ear in fidelity to their object.

These writings are part of a larger group (Brizio, 1954; see CN 3–6) that precedes the compilation in *Ms. A*, ca. 1490–1492. As far as the manuscript evidence can be generalized, the consensus of scholarship is that Leonardo continued to study the interaction of the *virtù visiva* and the species of objects which enter the eye as late as *Mss. D* and *F*, even though around 1490 he rejected traditional “emission” theories of vision. One of the last traditional statements on the problem of emission is in *Ms. A*, fol. 112v (R. 68), ca. 1492,

where Leonardo argues that the *virtù visiva* does not project rays because they would be consumed by the sun.

In Chapter 11 Leonardo's stated intention to prove that the "eye sees in straight lines which compose pyramids" is reminiscent of Alberti's schematic discussion of the pyramid of sight (*On Painting* 1.5). In *Ms. A* (fols. 36–41), Leonardo constructed the Albertian scheme and criticized it. However, even earlier optical writings, related to CA 90 r–b, ca. 1490, demonstrate his familiarity with Alberti because they include passages based on his treatise on painting (see, for example, CA 160 r–a, on how to compose figures in an *istoria*). These writings are also based on optical sources far more complex than Alberti's discussion.

The relationship of Chapter 11 to Leonardo's other writings can be discussed on the basis of a problem that is first solved in the early passage CA 90 r–b, concerning the ability of certain animals to see at night, where Leonardo rejects the possibility that the eye emits light. Traditionally, this topic is a consideration of whether the eye emits species in addition to receiving them. According to the intro-extromission theory of vision, as formulated by Robert Grosseteste and developed by Roger Bacon, all natural causation can be attributed to incorporeal likenesses or species which emanate from all objects through all parts of the medium; and the senses function by emitting as well as receiving species. In his definition of species, Bacon incorporated Alhazen's concept of the optical properties of form; and, according to Bacon, the species of the eye prepare "for the approach of species and ennoble the species of the object so it is conformable and commensurate to the eye" (*Opus majus*, 5, 1, Dist. 7, Ch. 4; see further Lindberg, 1967). Pecham, following Bacon, cited the night vision of certain animals as proof that species emanate from the eye and bestow power on colors (see Lindberg, 1983, iv and lvi ff., who credits Augustine with establishing the sense of *species* that remained current through the Middle Ages).

The formulation that the similitudes of bodies are carried through the medium "all in all and all in all the parts," a statement that recurs throughout Leonardo's optical writings, is essentially an expression of Bacon's concept of species but without the factor of emission. Leonardo had taken up the extromission theory of light explicitly on CA 138 v–b, CA 141 v–c, CA 270 r–b, and W. 19148, all belonging to the period ca. 1488–1490. On CA 90 r–b and CA 270 r–b, in arguments probably derived from Avicenna, Leonardo rejected the hypothesis Pecham advocates (CA 90 r–b: because experience shows that such nocturnal animals are incapacitated

when deprived of all light). Developing the solution on CA 90 r–b, Leonardo continued to investigate the problem of nocturnal vision in later writings (*Ms. H*, folio 86r, 1494; *Madrid Codex II*, folios 24r–25v, ca. 1503–1505; *Ms. D*, folio 5r–v, 1508; *Ms. G*, folio 44r, ca. 1510–1515), but he no longer considered the traditional problem of extromission; rather, he investigated the manner in which the eye accommodates to low levels of light. He compared the senses in this context, when he investigated the relationship between the functions of the eye and the imagination. For example: “the cat has the foremost senses of sight and hearing found in animals. And its sense of smell is almost equal to these senses. And where the visual power is lacking, it helps out with hearing; [the cat] always stands with its ear alert, like a funnel, to receive the impressions of loud noises which are made in the air, and sends them through wide open spaces to the common sense” (*Madrid Codex II*, fol. 25r).

In *Madrid Codex II* the comparisons of the senses reappear in the definitions of perspective as a mathematical science: Leonardo compared the study of perspective to “varied consonances on the different instruments” of the senses (subordinate to the eye) because all “consonances” are sent to the common sense (according to the final draft on fol. 67r). This appears to be a later formulation of the issues presented in Chapter 11 that places perspective in the hierarchy of the mathematical sciences.

After ca. 1490, Leonardo discussed “species” in a far more restricted manner than in source in Bacon. Most of his later comparisons of the senses speak to the issue of how visible images are apprehended, most often by comparing the transit of sound and light on a mechanistic model. But to cite a different comparison confronting the same problem, on *Ms. D*, fol. 7v, he considered whether the sensitive organ is the crystalline humor (at the surface of the eye, preserving Alhazen’s theory) or the optic nerve (in the inner sense, following Galen). Here he compared the optic nerve to the nerves involved in the sense of smell.

As in the passage just mentioned from *Ms. D*, Chapter 11 raises an inherent physiological difficulty in Alhazen’s mathematical theory of perspective. For, if the eye is “less deceived in its function” than the other senses because the rectilinear action of light can be ascertained or “certified” mathematically (by “the pyramid of sight”), but sound also travels through the medium in straight lines, then hearing is less certain (that is, more “deceived”) because its “species” pass to the sensitive organ by “tortuous and

reflected lines.” By this reasoning, the nobility of sight is maintained only if the sensitive organ meets the path of light directly, without obstruction; otherwise, visible species suffer the same fate as species passing to the sensitive organ of the ear.

According to Ackerman and Kemp, one of Leonardo’s major achievements was to abandon Alhazen’s hypothesis that light rays travel in straight lines to a point within the eye (Ackerman, 1978, 128; Kemp, 1977). Alhazen had in fact raised the issue of how the forms of light and color reach the brain when they no longer travel in straight lines but rather “gyrate” through the nerves (*De aspectibus*, 2.6), but he largely ignored the physiology of the eye in order to preserve the mathematical foundation of his theory of light. By the time of his early optical writings, ca. 1490, Leonardo had already carried out extensive projects on the anatomy of vision (W. 19059, *Anatomical Ms. B*, folio 42, dated 2 April 1489, and related sheets; see Kemp, 1971 and 1977b). He approached Alhazen’s theory of light on the foundation of Galen, probably read with the commentary of Avicenna (see CN 2). In Chapter 11, where the “gyrations” of hearing are applied to the problem of explaining vision, Leonardo had not yet seen the necessity, as he later did, of revising Alhazen’s theory to accommodate the physiology of the eye (on a structural analogy established by Aristotle, *De sensu et sensato*, 439–442), but he had begun to frame the problem that led him to do so.

The comparison of the species of the senses presented in Chapter 11 and developed elsewhere is important to arguments on the comparisons of the arts. Alberti had already applied an Aristotelian conception of the “species” of light as color to the theory of painting. Leonardo extended this analogy between painted and optical color substantially by drawing upon ancient rhetorical theory, likewise founded on Aristotle’s analogy of the senses, according to which sense is pleased in the same way by the verbal and visual modes (see for example, *Poetics* 1450b1–3). On the analogy of sound and color, Leonardo also made the arts of music and poetry the objects of hearing in the same way that painting and sculpture are the objects of sight (on the visual tradition of the representation of the five senses, see Nordenfalk; on the basis of these analyses in theories of proportion associated with Vitruvius, see Onians, 1988).

CN 12

This passage is excerpted from *Ms. A*, fol. 100r (lines 21–30, ed. Ravaisson-Mollien). In the original manuscript, the same ductus appears in the lower half of folio 89r, and folios 93v, 95r–114v; the last page of the text, folio 114v, is dated “10 July 1492.” Therefore, judging by the paleographic evidence, this passage and the other three passages excerpted from the same manuscript can all be dated 1492 (see CNs 19, 31, and 38). Chapter 12 also alludes to the preceding passage in *Ms. A*, which concludes that the painter has greater ability to “write the demonstrations of forms” than the poet (see CN 9).

Leonardo’s statement that “painting is the grandchild of nature” may be a paraphrase of Dante’s *Inferno*, Canto 11, verses 100–105: “Si che vostr’ arte a Dio quasi e’ nipote” (so that your art is, as it were, the grandchild of God), because Leonardo follows the sense of Dante’s text. The immediate context of Dante’s line is that Nature takes her example and her end from Divine Intellect: “And to thy Physics if good heed thou pay, / Thou wilt find, after but few pages turned / That your art follows her, far as it may,” where the reference is to Aristotle’s *Physics* (*Inferno*, ed. and trans. Milano, 60). Leonardo’s polemical praise of painting, here and at the end of the previous passage, claims that the scientific methods of painting (based on perspective) make it able to imitate the “visible works of nature.”

It has often been noted that the title and first line of Chapter 12 also suggest the opening line from Philostratus the Elder’s *Imagines* (“whoever scorns painting is unjust to truth”), and the whole passage, in fact, recalls the opening of the *Imagines*. In its original context in *Ms. A*, this statement is directly related to the statement on the previous folio that the eye “copiously and magnificently considers the infinite works of nature” (*Parte Prima*, Chapter 19). Chapter 12 also recalls bucolic contests between singers and poets to produce Arcadian descriptions out of stock motifs (see Curtius, 103; Gombrich, 1950; C. Gilbert, 1952; CN 13). Leonardo might have been familiar with the passage in Alberti’s treatise on architecture where Alberti, in similarly categorical fashion, praises *varietà* in paintings which depict “countrysides” and other subjects suitable for gardens. Like Philostratus, Alberti also praises the ability of poets to invent suitable subjects for paintings (*De re aedificatoria* 3.53 and 61; Zubov, 1960, 11 ff., notes Leonardo’s use of the 1486 edition of Alberti’s treatise, in *Ms. B*, ca. 1487–1490).

Leonardo's comparison of painting to poetry, however, is more immediately indebted to the medieval tradition of ekphrasis than it is to Alberti's neoclassicizing association of painting with the art of poetry. Following in the medieval rhetorical tradition for creating allegorical images of nature in the comparison of painting and poetry in *Ms. A* (fol. 99r [Chapter 19] and continued on folio 98v), Leonardo speaks of the "discrezione" of "shadows and places and of things placed" there. On fol. 92v, he describes modes of "arousing the 'ngiegnio'" to varied inventions by contemplating stains on walls or the sounds of bells, next to another well-known passage, on the ten "duties" (*hofizi*) of the eye "of which my little work will be interwoven" to instruct the painter in imitating the "work of nature and ornament of the world." Leonardo's association with Petrarchan poets at the Court of Milan undoubtedly contributed to his "natural allegories" based on such observations (Kemp, 1985; see Chapter Two). Gombrich (1952) has also suggested how Leonardo's desire to "animate" figures is based on poetic methods of invention. On the other hand, Leonardo also incorporated the humanist model of *compositio* that Alberti used to describe pictorial relief. The passages related to Alberti in this section of *Ms. A* are all derived from discussions in Book II of *della Pittura* on decorous pictorial composition and on the invention of the *istoria* by creating artificial *varietà* (see Appendix 1). The principle of *comparatio* or antithesis, well established in medieval poetics as well as humanist rhetoric, suggests how Leonardo integrated the two traditions.

SECTION 2

Comparisons of Painting and Poetry, Chapters 13–28

Chapter 19 of the *Parte Prima*, excerpted from *Ms. A*, fol. 99, ca. 1492, is the only extended comparison of painting and poetry preserved in Leonardo's original notes. The other 17 *Parte Prima* passages on the comparison of painting and poetry (Chapters 7, 8, 14 to 28 and the misplaced 46), which treat many of the same themes, can be considered either drafts for or later versions of Chapter 19. Internal evidence suggests that nearly all of them date from the same period around 1492, although Pedretti dates a few of the passages to Leonardo's final years at the Sforza Court, ca. 1500, on the basis of the scientific interests mentioned in passing (Pedretti, 1964, 177–178; for such an example, see Chapter 17).

The other comparisons of the arts included in the *Parte Prima* that can be associated with a definite manuscript source are those excerpted from *Libro A*, which Pedretti (1964) dates ca. 1508–1510



Ill. 21. Leonardo da Vinci. Studies of horses, lions, and dragons. Pen and ink. c. 1515. Windsor, Royal Library W12331.

in his reconstruction of the notebook. These comparisons all concern painting and sculpture, and they largely reiterate themes developed in another passage in *Ms. A*, which became Chapter 38 in the *Parte Prima*. This evidence also suggests that the theme of the comparison of the arts interested Leonardo primarily during the last decade of his stay at the Sforza Court. Yet the notion of comparing verbal descriptions to visual images intrigued Leonardo even in the latest period of his activity (see CN 45).

Unlike the definitions of painting in the first section of the *Parte Prima*, all the arguments concerning poetry are invectives. Some of the passages, as in Chapter 25, must reflect Leonardo's own irreverent wit, reported by Paolo Giovio and Vasari (see Pedretti, 1977, 2: 259–260). The first passage in the section introduces one of several debates included in the *Parte Prima* in which “the painter” defends his art against an imaginary opponent. This literary form is reminiscent of medieval *tenzons* and *contrasti*. Leonardo's discussion of words as having no universal value, in contrast to similitudes received by the eye, “the window of the soul,” and his discussion of the damage inflicted by the loss of the senses are both reminiscent of this genre (CN 26). Leonardo's arguments on the deprivation of the senses also derive from courtly literature and ultimately refer to an ancient tradition that philosophy is a meditation on death (see CN 24). His diatribe against poets who rob other sciences and his polemic against astrological divination certainly belong in the tradition of burlesque *tenzons*. Rivalries among *litterati* at the Court of Milan sometimes took on a similar tone of mock invective. The arguments are unlike the allegorical debates in Boethius' *Consolation of Philosophy* or Prudentius' psychomachies in that personified abstractions in *contrasti* are not based on a specific text. They do, however, likewise derive from late antique eclogues that treat the theme of the battle of the soul by projecting psychological states into visual descriptions of the external world.

The words “statue” or “painting” or “man in the image of God” appear in this literature in the sense of a mental image, picture, or likeness (see Kelly, 45). Leonardo's suggestion that painter and poet be judged on their depictions of a battle brings to mind poetic recitations of chivalric battles (see Chapter Two). A contest recorded by Angelo Decembrio between the painters Pisanello and Jacopo Bellini in 1441 belongs to the same tradition (cited in Baxandall, 1963, 314). Aside from a passing reference to the della Robbias in Chapter 37, however, Chapter 27 is the only passage that mentions a historical figure or event. Although they never met, Leonardo's anecdote is about King Matthias Corvinus of Hungary,

a great humanist collector who patronized many Italian artists, among them Andrea Mantegna, Desiderio de Settignano, Benedetto da Maiano, Bertoldo di Giovanni, Antonio Pollaiuolo, and Antonio Verrocchio as well as Leonardo (see Chapter Two). Since King Matthias, who had extensive diplomatic and trade relations with the Sforza Court as well as with Florence and Naples, died on April 6, 1490, Leonardo's anecdote probably dates before that time. His prose descriptions of paintings definitely emerged in the environment of the Court of Milan, where he collaborated with poets on various theatrical projects and where he himself experimented with a variety of literary genres including *facetie*, fables, emblematic conceits, poetic burlesques, and allegorical descriptions. *Ms. A*, ca. 1492, includes four ekphrastic descriptions of paintings, all of which were compiled into the *Codex Urbinas* (folios 101r, 111r, 220v, and 98v; ed. McMahon, nn. 281–284). These entertaining anecdotes are further testimony that dramatic debates over the value of the individual arts developed in a courtly setting.

Leonardo's prose lacks the classical erudition of Castiglione's comparison of painting, poetry, music, and sculpture in his *Il Cortegiano*, or Angelo Decembrio's disquisition on painting in a literary dialogue set at Leonello's court in Ferrara (*De politia litteraria*, ca. 1462). Martin Kemp has evaluated Leonardo's literary achievements as ranking behind those of his poet colleagues, except for his natural allegories (Kemp, 1985, 209). He has also convincingly suggested that Leonardo's verbal as well as visual descriptions of nature are filled with poetic devices—Petrarchan conceits and formal devices constructed on the favorite principle of antithesis—that he shared with (and borrowed from) his fellow poets at court. Outstanding examples of the manner in which these conventional habits of thinking are reflected in Leonardo's interart analogies are his literary descriptions of battles and storms which contrast with his descriptions of idyllic or pastoral landscapes (see CN 13).

Both tragic and pastoral types persist in Leonardo's writings. Following conventions established by ancient writers like Pliny the Elder, Plutarch, Dio Chrysostom, and the Philostrati, who praised the ingenuity of the painter who could imitate the inimitable qualities of nature, Leonardo repeated the themes and language of his early descriptions throughout his literary career. Leonardo's literary descriptions of battles and storms recall Plutarch's praise of historical accounts above poetic myth, when he extolled the battle scenes of Euphranor: even though painting, like poetry, "aims at being a false tale resembling a true one . . . it is only a pictured

image of actuality” (*Moralia*, 346.2–350.8; see further CN 13). Martin Kemp (1985, 210 ff.) has also compared the “Deluge drawings” at Windsor and related literary descriptions with the opening of Ovid’s *Metamorphoses* in which the supreme artificer organizes chaos into the orderly spheres of the four elements, and with Dante’s verbal imagery founded on Aristotelian natural philosophy.

Leonardo’s prose descriptions suggest parallels with his paintings that provide insight into late Quattrocento tastes. Many of the passages in the *Parte Prima* that proclaim painting superior to poetry or sculpture assert the ability of painting to represent the variety and ornament of natural phenomena, delineated as atmospheric haze, smoke, dust, transparent waters, turbulent wind, and the change of colors of sunset. Curtius (1947) has analyzed the means by which compositional formulas of landscape descriptions, originating in ancient Greek poetry, passed to the Middle Ages through the writings of Virgil, Ovid, Claudianus, and others. Conventional themes like the *locus amoenus*, elaborated according to rhetorical rules of invention, laid the foundation for a landscape tradition that extends from Antiquity to the Renaissance. Gombrich (1950) also notes that Renaissance literary descriptions resemble ancient delineations of stock landscape motifs according to categories found in Vitruvius (*De archit.*, 7.5) and Pliny (*Hist. nat.*, 35.116–117). Their divisions are in turn based on dramatic modes originating with Aristotle, who, linking poetry to music by their effect on the viewer, divided both media into the antithetical categories of pathos, appropriate to tragedy, and ethos, appropriate to comedy (*Poetics* 1450b1–2). These divisions reappeared in comparisons of painting and oratory by Cicero (*De oratore*, 19.65) and Quintilian (*Inst. orat.*, 12.10 ff), as well as discussions of austere and florid style by Horace in the *Ars poetica* that were adapted by Pliny the Elder to painting (*Hist. nat.* 35.94), which were major sources for medieval and Renaissance writers on literature, and writers on art since Alberti (widespread knowledge of Aristotle’s *Poetics* dates only from the mid-sixteenth century; see Weinberg). Leonardo’s interest in effects such as luminosity, the representation of atmosphere, and the juxtaposition of near and far views coincides with these literary descriptions and at the same time reflects interest in optical effects achieved by contemporary Netherlandish painters (and their Italian, especially Venetian, imitators). Both the literature and the paintings were greatly appreciated by Italian patrons (Gombrich, 1950; C. Gilbert, 1952; Turner).

In line with medieval writers such as Alain de Lille and Hugh of St. Victor, Leonardo overturned the Horatian stricture on artistic license in his analogy between painting and poetry as artifice. Cennini claimed that the painter, like the poet, composes fantastic figures which imitate natural appearances "as a means of embellishing these fundamental theories (*principali scienze*) with some jewel" (*Cennini, Il Libro dell'Arte*, 1.1; see further Janson; Summers, 1981, 44 ff.). Alberti also praised the power of painting to make the invisible visible (*De pictura*, 1.1). But Leonardo further claimed that the poet's knowledge of other sciences is merely embellished language: the poet "transmutes" himself by borrowing *scienza* "made by others." The charge is that the figured language of poetry is comparable to effects in nature which are "mutable," while the work of the painter who uses the science of optics is more noble because his work demonstrates the immutable causes of natural effects. In Chapter 19, Leonardo concludes this argument with examples of the painter's ability to deceive by his art, based on Pliny (*Hist. nat.*, 35.36.67).

Several discussions center on the poet's *discretion* or "ornaments of nature"; one of these discussions explicitly identifies these "ornaments" with the "ten varied discourses" of the painter (Chapter 33; see also Chapters 20, 36, 37, and 45). The "discourses" Leonardo lists derive from Aristotle's ten properties, or "predicates," i.e., expressions used to talk about any subject (*Topics* 102b; see Chapter Two; CN 17; introduction to the Commentary Notes on the mechanical arts. Leonardo first described the "ornaments of the world" in terms of the "ten functions of the eye" in *Ms. A*, fol. 102v, ca. 1492, where he writes that his "little work," presumably a treatise for painters, will be interwoven with these "duties" (*ofiti*). Passages on adjacent pages of the manuscript treat optical problems such as the reflection of colored light on a *corpo bianco* and the *aria* which gives *gratia* to faces in the manner of sculpted relief (see Chapter Three). These subjects may be directly indebted to Alhazen's discussion of beauty in terms of proportionality (see CN 27), as may Leonardo's argument that visual images are superior to words. Alhazen argued that a configuration on a page is beautiful in the case of pictures because their parts are comprehended all at once, unlike words, which must be seen in one mode and read to be understood in another (*Optics*, 2.3.205; compare *Ms. A*, fol. 108r, ca. 1492). Leonardo may have also known related arguments defending the status of perspective in relation to painting as a "true science" by Piero della Francesca (on Piero, see Elkins, 1987, 227) and Luca Pacioli (see CN 29).

According to Alhazen, beauty is a harmonious proportionality apprehended through sight but not visible to the eye. If duly proportioned, the conjunction of “visible intentions” is judged beautiful, by the internal power of the *virtus distinctiva*, but this “calculation” requires duration in time (*Optics*, 2.3.59). Alhazen’s “intentions” derive from Aristotle’s categories. Alhazen distinguished between *intuitio* (rendered in Latin translations by the same word as Boethius’ intelligible), the mode of cognition that apprehends beauty and gives certainty through a prolonged visual experience, and *aspectus*, the mode of vision that gives an immediate, “general and confused” sensation of vision (Lindberg; Federici-Vescovini, 1965; Summers, 1987). As early as Ptolemy’s *Optica*, one of Alhazen’s chief sources, deception caused by the internal power of the *virtus distinctiva* was thought to occur during consideration of “accidental predicates.” According to Ptolemy, error in judgment is due to the property of things, judged without knowledge of their cause, as in the percussions of color reverberating from a mirror, when we know “the figure of a thing” from “accidental properties” (Latin text in Ptolemy, 1956, 53).

Chapter 23 is a rare case in which Leonardo indicates that the mental processes associated with vision are not instantaneous. Leonardo’s understanding of the simultaneity of vision may follow more immediately from Nicole Oresme’s graphic method of “configuring” the commensurability of properties, or qualities. Oresme discussed the beauty of such configurations, for example of sound, as the harmony of “ten conditions” that concur to produce perfect beauty that can be said to be relatively beautiful with respect to the viewer. Oresme compared the “proportional quantity and intensity” of sound in a configuration, corresponding to an instant, to the beauty of a mixture of colors (*De configurationibus qualitatum et motuum*, 2.18 [ed. cit., 325], based on Aristotle, *De sensu et sensato* 439b–440b). Oresme’s discussion is derived from Alhazen’s discussion of beauty as “proportionality,” the “consonance of particular intentions” (*Optics* 2.3.201). Leonardo asserted that harmony, constructed artificially by art, contents the common sense with “sweet *concento*.” His argument follows from Aristotle’s theory, repeated by ancient and medieval writers, that “a mixed constitution produces a better harmony” because “sense is a ratio, and excess hurts or destroys” (*De Anima* 426a28–426b8; *De sensu et sensato* 439–440a; compare Cicero, *De natura deorum* 2.58; see further, CN 21).

In Chapter 25 Leonardo claimed that painting and poetry are both concerned with “invention and measure,” language that may

actually derive from discussions of invention and elocution in musical composition. There are artistic precedents for his scheme; for example, Ghiberti used "misura" to mean proportion (see CN 38). In the thirteenth century, John of Garland defined *rithmus* by comparison to the consonances of music, which are "either of the voice or of things": they are part of rhetorical embellishment or elocution called the "colors of rhetoric," which are "necessary in *rithmus* as in metrics" (*De Arte Prosayca, Metrica, et Rithmica*, cited in Murphy, 259). A close affinity between melodic invention and the meaning of words also existed in musical theories of composition, likewise based on rhetorical principles. There are additional reasons to suggest that Leonardo derived his categories of "invention and measure" not from poetry, as he maintained, but from music. New practices that simplified complex rules of rhythmic structure in favor of an expanded tonal system appear in music of the later fifteenth century. Among the earliest composers to praise innovation is Josquin des Prez, recently characterized as the first composer to "put all of his musical gifts into the service of expression of human affections," whom Leonardo may have known personally, since Josquin composed a motet, "Fama malum," based on Virgil, for the wedding of the Duke of Milan in 1489 (Blume, 26; see further CN 25).

In combining Alberti's theory of figurative movement with embellished descriptions of nature derived from medieval poetry, Leonardo seems not to have assimilated Alberti's restriction of artistic license; rather, he understood Alberti's prescriptions for achieving *varietà* and avoiding monotony as an endorsement of brilliant style. In this respect, Leonardo shares the view expressed in Averroes' epitome of Aristotle's *Poetics*, the only form in which Aristotle's treatise was known throughout the fifteenth century, where Averroes identifies all poetry with the epideictic modes of praise and blame. Averroes defines poetic imitation as representation in language joined with melody and meter: "the first part of the art of praise is to express [in words] noble concepts through which imaginative stimulation occurs. Then those concepts are enhanced by melody and meter appropriate to what is being expressed" (*Middle Commentary on Aristotle's Poetics*, 94). Thus harmony and composition "shape the soul" in a way "appropriate to receive the images of the things represented." Leonardo specifically praised variety, verisimilitude, brevity, and integrity as virtues of the painter, and his central claim, that the painter "can demonstrate each body and the integrity of its parts in a single aspect" with "great brevity and truth," suggests the quality of *imaginatio* or

enargeia praised by rhetorical writers. This quality makes scenes vivid before the eyes (*Rhetorica ad Herennium* 12.69.62; Cicero, *De oratore* 19.224.32ff; Quintilian, *Inst. orat.* 8.3.62ff.). Leonardo identified invention directly with the artist's representation of figural movement according to his own mental movements (i.e., imagination). Alberti, by contrast, identified the poet's ability to invent with his use of literary themes (*On Painting* 3.53).

Writers on music were among the first to value "natural instinct," a faculty Boethius had relegated to a lower stature than the knowledge of mathematical theory possessed by "true musicians." But the new Renaissance appreciation for the musician's natural gifts, which has been described as a kind of gifted inspiration practiced with extensive technical skill that is antithetical to Platonic "divine furor," overturned Boethius (Lowinsky, 1973, col. 312b ff.). Leonardo praised the painter's powers, in terms identical to the *ingegno* and *giudizio* of the musician (and still based on the rhetorical concept of *enargeia*), the vivid representation of emotion. There exist other contemporary polemics defending music over painting, poetry, and sculpture, derived ultimately from Plato's *Ion*, according to Lowinsky (1964, 488).

Yet Leonardo's critical values—his praise of brevity, truth to nature, variety, the figure seen in a single aspect, and unrestrained invention—clearly echo texts with medieval precedents. His comparison of poetry and painting follows a tradition for allegorical descriptions of nature by the poet whose *ingegno* dares "to aspire to the intuition of divine forms" in a "mirror of the senses" (Alaine de Lille, Prologue, *The Anticlaudianus*, 48). In literary theory of the twelfth century, *imaginatio*, closely associated with *ingenium*, designated a method of rhetorical demonstration for inventing poetic *picturae* by analogy. According to John of Garland, *descriptio* is a kind of rhetorical demonstration that orders visual qualities (Kelly, 26 ff.). Description of a person from head to foot is an example of one such conventional formula. The actions of personified figures in these allegories, constructed according to the methods of *imaginatio*, often exemplify the manner in which they are composed. When Alain de Lille, for example, described "Reason" as a personification of the movement of the mind between understanding and visualization, he suggested the device *expolitio* in which the subject is turned over repeatedly to vary the figure (*Anticlaudianus* 1.10; compare Geofrei of Vinsauf, *Poetria Nova*, 1244–1249, based on *Rhetorica ad Herennium*, 12.69–62; cited by Kelly, 43).

The association of poetic allegory with the science of nature can be traced to the influence of Plato's *Timaeus* (Wingate), especially

in the form that Macrobius accorded "true" fictive visions the status of philosophical discourse. Poetic techniques for constructing allegories, in the form of verbal images, are also founded on ancient rhetorical prescriptions for achieving *enargeia* or vividness. According to Quintilian, heightened (fictive) images are justified because "words can set souls afire with fictitious emotions"; and, therefore, because the orator has the power to feel his client's emotions; by displaying them he convinces the judge to make the right decision (*Inst. orat.* 6.2.32; a principle adopted by Horace, *Ars poetica*, line 111). Brilliant style, according to medieval theorists like Geofrei of Vinsauf, amplifies the *materia* in highly ornamented language that instructs by delighting the audience with sensuous, metaphorical images. Medieval writers held that mental images of fiction aid the soul to grace through what Macrobius termed a "narratio fabulosa" (*Commentary on Scipio's Dream* 1.9). The subject of fiction can be either "monstrosities" or "decent and dignified conception of holy truths . . . presented beneath a modest veil of allegory," the latter of which is approved for elevated subjects like disputations about the soul, or spirits or gods (*Ibid.*, 1.11–13).

Dolce stil'nuovo poetry of Leonardo's day reflects the scientific spirit instilled by such medieval followers of Macrobius as Thierry of Chartres or Hugh of St. Victor. Leonardo's defense of painting frequently challenges poetry in these terms, as for example when he claims that poetry requires commentators to reveal its concealed meaning whereas painting is immediately accessible (Chapter 18). Leonardo's high regard for brilliant, ornamented style, which he always defined with reference to nature, is suggestive of the Scholastic concept that beauty overcomes the senses. From Plato to Cicero and Vitruvius, to the late antique period, harmony artificially constructed by art, whether the *symmetria* of Greek temples or the *numerositas* of Latin prose, had been associated with the ability of the senses to delight in the well-proportioned ratio of parts. But medieval writers who incorporated neoplatonic ideas (via late antique discussions of *phantasia*) appreciated the simple, direct perception of radiance of the divine that shines through matter and overpowers the senses (see Panofsky, 1968; DeBruyne, 2: 23 ff.; Eco, especially 66 ff., 234; Klein, 1970, with reference to Renaissance notions). According to this mystical, platonic tradition, *stupore* and related conditions like *meraviglia* and *mirabilia* are all associated with the incapacitation of sight. This incapacitated condition, however, results in the direct, simple perception of brilliant beauty.

By the late Quattrocento, however, writers associated the stupefaction of the senses also with the direct perception of proportion or harmony. In his commentary to Plato's *Symposium*, Ficino credited composite as well as simple beauty with the ability to overcome the senses in rapture. He compared the "resonance of voices" sounding different notes of an octave and bodies "composed of many limbs, such as trees, animals," as well as simple bodies such as stones, with the "shapeliness" we put in the "joyful harmony of lights, shadows, and lines." According to Ficino, an angel reflects itself in God's visage and, seeing its reflection, marvels at it rapturously (*maravigliandosi con grande avidità*) and unites with it forever, just as the incorporeal light of the sun is received in a spiritual fashion by the eye, so that we see the inner harmony of the soul in the image (text cited in Panofsky, 1968, 139–141; see also Summers, 1981, 394).

In their comparisons of the objects of the senses Ficino and Leonardo both attest to the continued currency of late Scholastic notions of beauty. But discussions like the one in Chapter 21 also mark Leonardo's departure from the Scholastic tradition he inherited. Using the neoplatonic example of the lover's admiration for his image of the beloved, Leonardo argues (as Ficino does not) that harmony, defined as the *concento* or concordance of parts, must be "embraced" by the *virtù visiva* "at one and the same time." (On *concento* as "the proportions among tones of different pitch," see Winternitz, 205.) Alhazen discussed beauty as a "consonance among particular intentions," the "proportionality" of a configuration perceived by means of a complex intellectual operation in which the *virtus distinctiva* "calculates or measures the proportions of visible intentions" (*Optics*, 2.3.228–231; a vernacular translation of Alhazen probably used by Ghiberti was possibly known to Leonardo; see Federici-Vescovini, 129, and von Schlosser, 1912, 2: 105). Ficino, who also wrote a treatise on optics (now lost; see R. Klein, 1965, 211), followed Scholastic writers like Aquinas who compared sense experience to knowledge gained through similitude only as an analogy. But Leonardo took the analogy literally when he explained that "proportionality arises from the judgment of the senses in the process of cognition."

Ficino's neoplatonic theory of love—that the soul ascends to grace by contemplating the visible beauty of the beloved—had many echoes, partly because of his debt to Augustine's psychology of vision (see *De Trinitate*, 11.3–11; *Confessions* 10.34; on Ficino, see Kristeller, 1945; on the tradition, see Summers, 1977). The same psychology underlies Leonardo's understanding, except that

Leonardo differentiated sharply between functions of the fantasy in the enjoyment of visible beauty and in contemplation of God. Other, more conventional, references to painting are common in contemporary discussions of love, such as Lorenzo de' Medici's sonnet in which he compares vision to the affections of his heart, painted with an image of his beloved (*Commento sopra alcuni de' suoi sonetti*, 2: 67).

Castiglione's discussion, in *Il libro del Cortegiano*, Book 4, of "judgment without passion," a "natural instinct" that rules the conduct of the perfect courtier, closely resembles Leonardo's disassociation of love and sight from the passion of divine inspiration. Castiglione's interlocuter "Pietro Bembo," after citing a string of neoplatonic commonplaces (e.g., the sight of beautiful women "inflames our souls" by a "similitude of divine love"), explains how the courtier properly loves. He defines love as a "certain desire to enjoy beauty" that "infuses itself and shines forth brilliantly." Bembo adds, in terms resembling Leonardo's that the judgment of the senses, locked in its "earthly prison," is fallacious when it is "preceded by knowledge." The "blind judgment of sense" enters the divine path of love only when it is *aided* by reason, in which case the imagination shapes a form or "universal concept" by which the philosopher purges his imagination, dazzled by that grander light (*Il libro del Cortegiano*, 4.62; *Book of the Courtier*, ed. and trans. Singleton, 345 ff.). Castiglione, revising Augustinian ideas, grants to sense experience and the imagination, in combination, the ability to form "universal concepts." Similar ideas are reflected in Chapter 16 of the *Parte Prima* which initially sounds like a traditional *contrasto* but is permeated with the scientific rationalism of Leonardo's optical studies.

In major respects, Leonardo's conception of the imagination still agreed with Ficino's, and especially with that of Ficino's close associate Gianfrancesco Pico della Mirandola, who followed Aristotle closely in his youthful treatise on the imagination (on Pico, see Caplan, Introduction, *On the Imagination*, 36–37, n. 2). Pico read the account of inspiration in the *Phaedrus* as praise for the mind to be "freed from the fetters of the body by its *own* power," and thus praised man for his ability to rise above his animal nature through fantasy, by inventing numerous arts, transcending the mechanical arts to develop the liberal ones (*Theologica Platonica* 13, cap. 2 on *Phaedrus* 224–229; cited in Trinkaus, 479 ff.). Pico based his discussion of "imaginative vision" on Scholastic definitions of human discourse that distinguish between human ratiocination and angelic modes of knowledge (*De imaginatione*, 5 and 81; compare

Parte Prima, Chapters 13 and 21). Following Aristotle (and in line with certain late Scholastic views), Pico (63) stated that imagination judges light and color, the special objects of the sense of sight, and sound without error (on Scholastic views, see Kretzmann, ed., *The Cambridge History of Later Medieval Philosophy*, 128 ff.). Pico did not discuss, however, the artistic activity of the productive or poetic imagination; rather, he described how divine truth is revealed by “imaginative vision” in terms that are analogous to Leonardo’s account of the viewer who comprehends the work of a painter immediately. According to Pico, the mode of knowledge exercised by angels is more perfect than ratiocination because it is “more like to God.” Whoever “more nearly approaches this method of cognizing is thereby further removed from accident and error.” Leonardo never discussed immediate cognition through sight in such metaphysical terms, but his claim that painting “demonstrates” causes in nature is similar in that both writers go beyond Scholastic precedents to claim that vision can result in error-free knowledge instantaneously.

Pico’s distinction between the discursive process of human reasoning beginning from sense experience and the ability of God and angels to know everything “by one glance” follows Augustine and many later Scholastic discussions of discourse. The closing thought of Chapter 13, where Leonardo compares the power of the painter to see and make whatever he desires, “whatever there is in the universe by essence, presence, or imagination,” belongs to the same tradition. To describe human discourse, Aquinas cites Augustine (*In de Trinitate* 14.3, explaining how “in heaven our thoughts will not be fleeting, going from one thing to another, but we shall survey all true knowledge at the same time by one glance”). Praise of seeing things at “a single glance” occurs in many of Leonardo’s comparisons of the arts. His idea that painting is created by “discourse” but viewed all at one time like eternal, divine “essences” is central to his defense of painting.

This encomium to nature, created by the hand of the artist in likeness to the world created by God, has many literary antecedents, but perhaps none as well known as Augustine’s description of the “conditions of angels and men” in *De civitate dei* (Book 22.24). Augustine imagines an eternity that bears an “outward appearance of continuity” with the created world because, as some sink in death, so others rise. The symmetry of macrocosm and microcosm developed together with the metaphor of Divine Craftsman who creates a world in the manner of a craftsman (Solmsen)—ancient and medieval themes that Leonardo combined

in Chapter 13 when he praised the painter who fashions art out of his imagination. From Plato to Augustine to Scholastic writers such as Vincent of Beauvais (*Speculum Naturale*, 28.3), panegyrics on the beauty of the created world had extolled the beneficence of sight. From Ovid (*Metamorphoses*, 1.85.86) to Isidore (*Etymologiae*, 11.1), and throughout the Middle Ages, writers repeated the commonplace that man's capability to turn his eyes to the heavens is ennobling. Leonardo's studies of the eye in physiological terms can be associated with this widely diffused cosmology (see Chapter Two). An argument by Andreas Capellanus suggests how Leonardo's study of medieval optics is also related to neoplatonic doctrines of love: the blind man cannot see anything upon which his mind can reflect immoderately, and so love cannot arise in him (Capellanus, 33). Such commonplaces were repeated in many fifteenth- and sixteenth-century poetic debates on the metaphysics of love, some of which were composed by humanists (including Benedetto Varchi; see *Scritti* 3: 625). In his poem *Altercazione*, mentioned above, Lorenzo de' Medici discussed imagination by distinguishing between reason and the judgment of the senses with reference to the visual arts (*Altercazione*, 3.28 ff.; 5.100 ff.; see also Chastel, 1960, 229).

These discussions of inner nature, in terms of *ingenium*, or the natural gifts or inventive powers shared by poets and painters, may have contributed to early humanist arguments that the orator had license to remain free of dogma. Humanists like Coluccio Salutati, who argued for the orator's right to discourse *in utramque partem disserere*, recast an issue formulated by medieval writers who identified both rhetoric and dialectic with contingent knowledge. Petrarch, like Alain de Lille in this respect, praised truth and brevity as artful speech in terms drawn from Cicero and Augustine (on Petrarch, *De vita solitaria*, see Seigel, 44). But whereas Alain had defined rhetorical demonstration in terms of "figures" that illustrate the principles of argumentation in sensible images, fifteenth-century humanists defended the status of rhetoric on the grounds that probable demonstration, or verisimilitude, tied to the common sense, is the instrument of moral philosophy.

Leonardo, like his sixteenth-century successors, drew from both traditions (see Chapter Two). While it is difficult to determine what Leonardo owed to resulting humanist defenses of *elocutio*, a genealogy of issues can be suggested. The humanist theme that ordinary, natural language tied to the common sense is worthy of praise was developed by Lorenzo Valla into a theory of rhetorical argumentation that emphasizes verisimilitude through the inclu-

sion of concrete visual exempla. Alberti's *della Pittura* has been cited as participating in the same trend of devising more powerful methods of rhetorical argumentation (Gray, 501). And many writers followed Valla (who followed primarily Quintilian) by composing dialogues that deliberately balanced arguments on all sides of a question (N. Gilbert, 1971; Marsh). One famous literary dispute, between Pico della Mirandola and Ermolao Barbaro in 1485, centered on the role of eloquence in philosophy in this context: good arguments can be adduced on either side of a question, but "true eloquence" must have substance (Breen). Thus, when Leonardo addressed the issue of truth in painted imitation, even though his discussion seemed to be limited to painting and poetry, he used arguments that had important, immediate precedents in humanist polemics in defense of eloquence.

Furthermore, the "ten ornaments" Leonardo derived from Aristotle's categories by way of optical theory were also incorporated into humanist theories of rhetorical invention, thus providing additional correspondences between humanist and artistic issues. Leonardo's discussion of *materia* as the *semplice corpo* of poetry is reminiscent of fifteenth-century rhetorical theory perhaps only because optics and rhetoric shared mathematical terminology, but this circumstance reinforced humanists' and artists' shared interests in the value of artifice and artistic license. Lorenza Valla described the elements of argumentation in mathematical terms as a visual configuration: the "materia" consists of *corporis* and *forma*, which are "clothed" (*veluti*) in color, figure, weight, and so on, called the *compositum* (*Dialectica libri tres*, ca. 1440, Proem). Lorenzo, like his successor Giorgio Valla, based his mode of argumentation on Aristotle's predicaments, as had medieval theorists of speculative grammar (Murphy, 142 ff.). As early as 1492, Leonardo identified the subordinate elements of painting with these same Aristotelian categories (see CN 20). Humanists beginning with Lorenzo Valla who incorporated logical procedures in their rhetorical demonstrations reduced Aristotle's predicables to concrete, philological (as opposed to metaphysical) terms. Lorenzo Valla incorporated mathematical terminology and Aristotelian predicaments to redefine rhetorical figures like *translatio*, *comparatio*, and *compositio*, constructions that had belonged to *descriptio* in medieval literary theory. The resemblance to Leonardo's definition of painting as a mathematical science filled with "discourses" or "ornaments" is noteworthy. Valla, moreover, compared the *materia* of argumentation, which he defined in Euclidean

terms and described as being "clothed" in Aristotelian accidental qualities, with the marble in a statue. *Forma* itself is *figura*, which we can imagine without matter (*Dialectica libri tres*, Chapter 2); Poliziano and other late fifteenth-century theorists followed Valla's precedent (see Vasoli, 1968; Monfasani). George of Trebizond defined *descriptio* as that which contains and presents all the "accidental differences" that cannot be separated from the object (Vasoli, 1968, 98). Giorgio Valla adopted the same procedures. These later Quattrocento humanists associated the probable syllogism of logic with the enthymeme of rhetoric, based on "experiment." Lorenzo Valla had set this precedent when he equated Aristotle's predicaments with *qualità* and *actio*, that is, data collated directly by sense or intellect (Vasoli, 1968, 58). Insisting that the study of essential elements is necessary to a theory of rhetorical demonstration, Lorenzo Valla (in a comparison suggestive of Leonardo) distinguished between *definitio* and *descriptio* in critical terms. He compared the former to a "pittura chiara" and the latter to an "imagine opaca et oscura" (cited in Vasoli, 1968, 141).

While it would take a separate study to establish the extent of connections between medieval and humanist rhetorical theory, and between literary and artistic issues emerging at the end of the Quattrocento, these examples suggest how writers as diverse as Lorenzo Valla and Leonardo shared certain common concerns and language. When they adopted Aristotelian logic as an instrument of invention, humanists devised a persuasive mode of argumentation grounded in mathematical terminology that could be applied in the common language of orators and poets. Humanists had access to the "logica modernorum" developed in northern universities (Gilbert, 1960; Seigl; Nuchelmans). But Leonardo had access to some of the same contacts at the Court of Milan; the Studio Pavese was particularly known for its interest in "nominalist" logic (Vasoli, 1968, 132; on the personalities, see Malaguzzi-Valeri). Furthermore, as has recently been noted, the same nominalist trends in rhetoric had influenced Leonardo's source Alberti, who, in his treatise on painting, substituted Euclidean elements in his discussion of drawing based on Quintilian's *elementa* (Wright, 58).

Leonardo's defense of painting against poetry is also in line with current humanist classifications of the productive arts and sciences, such as Giorgio Valla's scheme in which the theoretical sciences ordered to practical use replaced the traditional mechanical arts. The new practical sciences mirrored the practical, liberal arts, which Valla identified as the arts of "armonia" and exalted for their communicative function (*De expetendis et fugiendis rebus*, cited in

Vasoli, 1981/1982, 249 and 253). In addition to using nearly equivalent terminology, Leonardo agreed with contemporaries like Valla that the practical arts are founded theoretically on the mathematical principle of harmony. In Valla's encyclopedia (owned by Leonardo), the mathematical sciences are selectively integrated into a framework of humanist literary disciplines, and several ancient Greek mathematical texts were newly made available in Latin (Rose, 48–49; on Leonardo's debt to Valla, see Marinoni, 1944/1952; McCabe).

Leonardo's discussion can also be referred to an ancient tradition of technology. Vitruvius and Lucretius assigned prominent roles to *ingenium* in the development of technology (T. Cole, 35). Vitruvius, the main line for the transmission of this tradition, devoted extensive discussions to engineering practices based on knowledge of geometry and mechanics. This Vitruvian heritage is reflected in Roberto Valturio's fifteenth-century treatise on the military arts which Leonardo studied extensively (Marinoni, 1944/1952; Marani). In this connection, Luca Pacioli, in his 1498 dedication of the *De divina proportione*, provides additional evidence for Leonardo's positive evaluation of the mechanical arts. In a passage that recalls Chapter 28 of the *Parte Prima*, Pacioli borrowed Valturio's description of instruments of war to praise the useful exercise of arts "not possible without knowledge of geometry, arithmetic and proportion" by engineers and new "machinatori" (*Scritti* 1: 62, where the editor notes that Francesco di Giorgio made similar claims). There are further contemporary parallels: in his treatise on architecture published in 1486 (another book Leonardo owned), Alberti revised Vitruvius by presenting a new scheme of sciences necessary to the architect. Alberti argued that painting and mathematics are the only arts absolutely necessary to the architect (*De re aedificatoria*, Book 9.10; compare Vitruvius, *De architectura*, Book 1. 1.3–17). The varied functions of artisans, including painters, who practiced as engineers and other kinds of technical consultants is evidence of the increasing stature awarded to the mechanical arts, and emerging scientific attitudes in the Renaissance (see Goldthwaite; Hollingsworth; Long). The most recent monographic study of Leonardo has justifiably emphasized his sustained activities as an engineer (Kemp, 1981; Leonardo's views on the mechanical arts are discussed further in the introduction to the Commentary Notes on the mechanical arts).

Leonardo's claim that paintings, unlike words, are the works of nature because they resemble natural appearances occurs frequently in discussions of the mechanical arts. The argument can be

referred to earlier issues concerning the relative merits of word and image formulated during the Iconoclastic controversies of the eighth century, and widely diffused by medieval writers like Hugh of St. Victor. According to Hugh, images of God could reveal knowledge of God beyond the power of words because words are arbitrary conventions made by man, whereas wordless manifestations take into account visible qualities; images speak in the language of God (*De Scriptori et Scriptoribus Sacris*, Cap. 14, cited by Berliner, 277; on the history of Iconoclasm, see Herrin; on the theory of images, see Pelikan; Ladner; Freedberg). Hugh of St. Victor valued images above words because most words have only "two or three meanings, but every thing may mean as many other things as it has visible or invisible qualities in common with other things" (Berliner, 272, citing Migne, *Patr. lat.*, 175, col. 20 ff). According to Hugh, the outline of an image, or its shape, has the purpose of "stimulating the memory and inciting the emulation of what may be represented" (*De imaginibus*, cited by Berliner, 277). Leonardo's statement that painting imitates the shapes (*figure*) that enclose the works of nature stands as a successor to this medieval statement on the manner in which the shapeless receives shape in accordance with our nature. Hugh also argued that the soul can immediately know the intelligible (i.e., God) through a visual image. His ideas, which Leonardo may never have known directly, are indebted to Aristotle's theory that the memory creates "universals" selected out of sense impressions (*Post. Analytics* 99b35–100b). Aristotle's model, transformed by late antique writers who praised the divine power of the "phantasia" to imagine things not found in nature (Pollitt) was incorporated by Iconophiles like John of Damascus into a theological justification of images (Bundy; Visser). Perhaps Leonardo's arguments, which frequently refer to the efficacy of devotional images, are more directly indebted to the fifteenth-century revival of the Greek texts due in part to the presence in Florence of Greek theologians like Giorgio Plethon, who attended the Council of 1439 to mend the schism between the Eastern and Western churches (see further CN 26; on Plethon, see Woodhouse).

CN 13

This passage is one of Leonardo's greatest literary efforts, ranked alongside his descriptions of imaginary paintings, especially those accompanying the Deluge studies (W12665 and related sheets; see Clark, *Windsor Cat.*; Pedretti, *Comm.* at R. 607–611). The painter's

powers of invention to produce “marvelously constructed” works of nature is also the subject of another, late encomium, although not in the same polished prose, W19001a (*Anatomical Ms. B*, fol. 2r, ca. 1510, R. 1140 and R. 856; see Pedretti, *Comm.* to R. 1140). Leonardo often described the landscape of a vista extending to a distant mountain view—in a variety of writings ranging from descriptions of paintings, to instructions to students on how to paint landscapes, to observations of natural landscape. The tempest (*fortuna*) described in *Ms. A*, fol. 101r (R. 606), or W12698 (R. 688, dated 1505–1510 by Pedretti, but standing in the same emblematic tradition as other productions for the Sforza Court; see also, *Codex Urbinas*, ed. McMahon, n. 820), are early versions of the late Windsor Deluge descriptions. Similar fantasies are described in two other passages, *Ms. G*, fol. 6v, and *Codex Urbinas*, ed. McMahon n. 553. Descriptions of landscape focusing on the benign beauties of nature are equally well represented: in *Ms. A*, *Ms. I* (fols. 48r, 87 r–v), *Ms. F* (fol. 18r), *Codex Arundel* (fol. 113v–114v), throughout *Mss. E*, and *G*, in writings known only through the *Codex Urbinas* (especially, McMahon nn. 548, 823–39), and on folios of the *Codex Atlanticus* (79 r–c, 184 v–c, for example).

In Chapter 13, details are enumerated in antithetical pairs according to conventional prescriptions for achieving copious variety. Literary descriptions of place derive from judicial rhetoric, where the “locus” sets the place of an argument and the “topic” determines how the evidence will be considered (Kelly). These forms were developed independently into various forms of oratorical display. *Elocutio* flourished in medieval poetic debates based on bucolic themes in which the contestants contrived catalogues of landscape elements that they invented according to compositional formulas derived from ancient eclogues, especially by Virgil (Curtius; on the *locus amoenus* in courtly romances, see Crane; Neilson). Leonardo’s literary efforts resemble these ancient and medieval delineations of stock landscape motifs (Gombrich, 1950; Kemp 1985; see also Chapter Two).

Chapter 13 is also related to a group of writings in which Leonardo explained how the mind of the painter is “transmuted” into the mind of nature. On *Ms. A*, folio 112v (R. 506), ca. 1492, he writes that the *ingegno* of the painter ought to resemble the similitudes in a mirror which are “always transmuted by the color of the objects placed opposite it.” The painter should know how to use his *fantasia* by turning his attention to various objects, considering “now this thing and now that, collecting a store of diverse facts selected and chosen from those of less value.” Even at the end of his

life, Leonardo wrote in identical terms that the mind of the painter “should be equal in nature to the surface of the mirror,” which transmutes itself according to the variations of objects that come before it (CA 184 v–c, ca. 1515; see also McMahon nn. 65, 280, and 175, from fols. 36 r–v of the *Codex Urbinas*, from an unknown source). He connected the artist’s *ingegno* or powers of imagination with the “categories of vision,” based on Aristotle and later optical theorists, and with the “ornaments of nature,” derived from literary theory. The notion of the *fantasia* as a complex of powers that could both collect images, as a mirrored surface is “impressed” with images, and function like a syllogistic process originates with Aristotle (*De memoria et reminiscencia* 449b ff.), and the associations were reinforced by subsequent writers from Boethius to Alhazen, although it is difficult to say whether Leonardo’s manuscripts reflect a direct transmission of these sources. The wording of *Ms. A*, fol. 113v, is sufficiently close to Dante’s discussion of sight in the *Convivio* that this might have been Leonardo’s immediate source (see CN 2).

Following a Scholastic distinction between human and divine reason with reference to vision, Leonardo concludes that, just as the imagination of the artist works in the same manner as the Divine Craftsman who comprehends all at one “glance,” so the productive act of the painter is a simultaneous act; the painter’s hands create “in pari tempo” (see Reader’s Notes and Chapter Two). The emphasis is not on the work created, but on the activity of the artist, and belongs to a long tradition for coupling skill of hand with the power of fantasy in an analogy to the workings of nature. Perhaps the earliest comparative example by a painter is Cennini’s account of God’s creation of man and man’s invention of painting (*Libro dell’Arte*, chapter 1). An echo of this formula is sounded in the opening lines of Chapter 13, where Leonardo, like Cennini, reverses Horace’s stricture on poetic license to claim that the artist can generate whatever beauties or monsters he wishes to see. It has often been claimed about this passage that Leonardo was unprecedented in stating that the artist is a “creator” of nature, but the word “creatore” is actually a later emendation of the text (Panofsky, 1963; see the Reader’s Notes).

CN 14

The central theme in the present passage, the nobility of art, is indebted to medieval definitions of the mechanical arts (discussed in CNs 7–8; on the problems of dating the passages, see CN 19).

More generally, Leonardo's discussion of nobility is indebted to Scholasticism (see Chapter Two). Thomas Aquinas, in his commentary on Aristotle's *Metaphysics* (XII.L.8: C2543), defined "nobility" in terms used throughout the Middle Ages and Renaissance: whatever is "divine and noble" is so to a higher degree by contact with the "first intelligible object, which is God." Dante in the *Convivio* (4.1.2–4) referred to this principle of nobility when he wrote that one thing in nature "mutates" into another "like the love of one communicates with another." The widely used neoplatonic metaphor of the soul desiring perfection as "a mirror or blazing image of its object of love" is founded on the same Scholastic analogy that the mind of man and God correspond on the principle of movement, or manner in which they produce or operate (Chastel, 1975, 58–61, 82). Similarly, Leonardo's discussion of lovers who are moved by portraits of their beloved refers to a broadly diffused neoplatonic theory of love based on a Scholastic conception of nobility (see CN 24; on the centrality of the issue of judgment to Leonardo's considerations, see CN 18).

Medieval writers defended the poet's pictorial fiction (*factum*) as philosophical discourse. They were succeeded by early humanists who argued that figurative language is the proper vehicle for expressing philosophical truth. The first modern writer on art, Cennini, is indebted to the same defense of poetic language when he claims that the painter, like the poet, imitates natural appearances "as a means of embellishing scientific principles (*principali scienze*) with some jewel" (Cennini, *Il Libro dell'Arte* 1.1; see further, Janson; Summers, 1981, 44 ff.). In similar Horatian terms Alberti also praised the power of painting to make the invisible visible (*On Painting* 1.1). In the present polemic, Leonardo attacks this long-standing equality between painting and poetry when he argues that the poet borrows from the sciences merely to embellish language: the poet "transmutes" himself by borrowing *scienza* "made by others." The charge (grounded in the language of medieval metaphysics) is that the figured language of poetry is comparable to effects in nature that are "mutable," while the work of the painter is noble because it demonstrates the immutable causes of natural effects. Leonardo concludes the argument with examples of the painter's ability to deceive by his art (see CN 7). Related arguments defending the status of perspective in relation to painting as a "true science" were made by Piero della Francesca (Elkins, 1987, 227) and Luca Pacioli (see CN 29).

CN 15

Inverting the Horatian dictum of moderation once more, Leonardo praises the unrestrained license that poets and painters share to invent monsters out of the imagination (compare *Ars poetica*, lines 1–14, 180–182, and 347–390; see also Chapter 13 and note *sub numero*). Leonardo's discussion of the internal senses derives from Avicenna; in this passage the terms are closest to writings datable c. 1490–1492 (see CN 19 on dating).

Scholastic writers, like Leonardo, also praised the efficacy of visual images over auditory ones in arousing piety. Theoretical writings in praise of the eye and the imaginative powers were known in abundance in the fifteenth century (see CN 24 on *devotio moderna* in relation to visual art; see also Berliner; Ringbom), but the closest precedents to Leonardo's arguments are found in secular sources, poetic debates that often parody theological issues (on *tenzons* and *contrasti*, see Chapter Two). Leonardo's suggestion that painter and poet be judged on their depictions of a battle brings to mind other poetic models, particularly recitations of chivalric battles. Many of Leonardo's favorite themes, such as the figure seen from all sides, echo these medieval texts, which frequently incorporate poetic *picturae* (again, see Chapter Two).

CN 16

It is difficult to assign a date to this literary production, but the passage definitely reflects the spirit of Duke Lodovico's court (see Kemp, 1985; on ideal canons of female beauty, see Cropper, 1967).

The only direct reference to visual art in this passage is the remark that mutes like to draw (compare Pliny *Nat. hist.* 35.7.24). This passage, more than any other in the *Parte Prima*, is indebted to the genre of troubador poetic debates known by various names (see Chapter Two). Chapter 16 is, in fact, a prose *contrasto*. Following these literary precedents, Leonardo discussed the benefits of love according to the medieval tradition that defines the aims of the mechanical and liberal arts in terms of a distinction between use and beauty. Comparisons of the eye and the heart are more frequent subjects in *contrasti*; but comparisons of sight with the other senses are not uncommon either (compare Steinschneider, nn. 59, 117). Leonardo's contributions, like similar passages in Castiglione's *Corteigiano*, recall *dubbi* or *questioni* of love incorporated into prose romances like Boccaccio's *Amorosa Visione*, where conversational debates were conducted in front of imaginary paintings and sculptures. The question that forms the title of Leonardo's argument

is a variation on a classic *questione*, originating in Provençal and Arabic poetry: “do the eyes or the heart contribute more to preserve love in a faithful lover?” A French variant from the second half of the thirteenth century is close to Leonardo’s version: “two lovers equal in merit address the same lady; one becomes blind, the other deaf and dumb; which loses greater chance of success?” (cited by Crane, 14; compare the traditional *tenzon* theme used by Dante, as noted by Schlosser, 1964, 82: the man born blind has not the possibility of loving).

Leonardo’s comparison of sight and divine knowledge, the latter “disputed with great shouting and coming to blows,” is another commonplace, phrased in a tone of parody that might have suited an audience at a light courtly entertainment (see Garin, 1956, 554–597, on the Milanese court polemics). Although it is not composed in the form of a poetic *contrasto*, Gaspare Visconti’s defense of love and poetry suggests what a rejoinder to Leonardo’s argument might have been like. Visconti, citing Plato in the *Phaedrus* and *Alcibiades* as support for his claim, writes that those who abhor and debase “le amorose scripture” will proceed with “ficta philosophia,” because true philosophers surround themselves with the most eminent and admirable men (cited in Garin, 1956, 582). Leonardo’s chiding dismissal of the philosopher’s frenzy, which refers to *furor poeticus*, must allude to the traditional issue of whether love originates from sight (one of Leonardo’s immediate sources seems to be Galen: see Chapter Two; on neoplatonic theories of the soul seeking grace, R. Klein, 1971; for an overview of *furor divinus*, Wittkower, 1973). Among Leonardo’s contemporaries, Castiglione discussed sense experience in terms similar to the scientific rationalism of Chapter 16 (compare Chapter 25).

CN 17

Although the argument here is polemical, the passage is closely related to formal definitions of painting as a mathematical science, especially in Chapter 6, where the hierarchy of the sciences is discussed with reference to astronomy, and in *Madrid Codex II*, fol. 67r. The passage is probably a late formulation, like Chapter 6, although the language is so similar to the definitions of painting in *Madrid Codex II* that it may date as early as 1503–1505.

In Chapter 17 Leonardo creates a new place for painting in the traditional Aristotelian ordering of the sciences by arguing that painting is superior to mathematical astrology because the astronomer and geometer are concerned with quantity, while the painter is also concerned with quality. The central point of his argument is indebted to Aristotle’s distinction that the physical scientist is

concerned with "difficulties which are not present in mathematics, for mathematics deals with an abstract and physics with a more concrete object" (*Gen. et Corr.* 299a15–16). The physicist deals with attributes or properties of corporeal bodies, according to Aristotle, who defined ten properties, or "predicaments," i.e., expressions used to talk about any subject. Quantity can be discrete, like number and speech; or continuous, like line, surface, and solid, or time and space (*Categories* 4a10–30). Alteration, that is motion, takes place with respect to certain qualities (*Gen. et Corr.* 314,618–315a). Only quantity is measurable (as in the number two), while quality, as in the change from white to black, depends on a substratum of a single element. Medieval scientists contributed to Aristotelian physics in their departure from Aristotle's position that qualitative change cannot be measured quantitatively. They conceived of motion as the configuration that a moving object attains at each present moment: in other words, motion is an inherent attribute, or quality, or property, of an object (see A. Maier, 1982). By analyzing qualitative change in the same manner as mathematical quantities, physical scientists like Nicole Oresme regarded qualitative change such as the alteration from black to white, or the velocity of an object moving from one place to another, as being equally capable of being represented as "configuration." That is, qualitative change could be expressed as extensions in magnitude (Oresme, 1968, 28 ff.)

It is not necessary to suggest that Leonardo was deeply acquainted with nominalist physics, as Duhem once did, even though by 1503–1504, Leonardo probably owned at least one nominalist work, Burley's treatise on the intension and remission of qualities, and apparently he also knew Oresme's work (see Reti, 1974, n. 10; on Oresme, see CN 29). Oresme devised a graphic method for "configuring" the commensurability of properties or qualities (on a bi-coordinate axis) on the foundation of discussions by Euclid and Alhazen, and like Leonardo, he discussed the beauty of such configurations. For example, Oresme conceived of the harmony of "ten conditions" that can be said to be beautiful with respect to the viewer (*De configurationibus qualitatum et motuum*, 2.18, based on Aristotle, *De sensu et sensato* 439b–440b; see Oresme, 1968, 325). Leonardo's familiarity with these ideas apparently developed through his study of optical theory and Euclidean geometry. In Chapter 17, the reference to geometry as "reducing every surface" to the figure of the square and the cube, and arithmetic as concerned with square and cube roots, refers to the commensurability of ratios. His later geometric studies revolve around the quadrature of curved

figures and, as an extension of quadrature to cubature, the transformation of volumes (McCabe, 6). His earliest known study of related problems can be dated ca. 1478 (CA 792 v–b; cited by McCabe, 13); by ca. 1497 he was interested in the quadrature of circles, and in 1505 he drafted a treatise on the transformation of volumes (*Forster I*; see McCabe, 28, 41 ff., and 38, describing Leonardo's concept of transformation as the movement of one figure into another).

Oresme's discussion is immediately indebted to Alhazen's discussion of beauty as "proportionality," or the "consonance of particular intentions" (Alhazen, *De aspectibus*, 2.59). According to Alhazen, beauty is comprehended by the *virtus distinctiva* by the prolonged repetition of sight. However, in the Italian translation of Alhazen, *Vaticanus 4595*, probably used by Ghiberti and perhaps an additional source of Leonardo's knowledge, this discussion of beauty was slightly altered by the anonymous translator to claim that the viewer will see "what makes beauty in the soul, immediately." ("E sera alcuna intentione de quelle sicondo el modo che facie belecia, in l'anima, subito, el viso apresso lo risguardaminto de quello quatare, comprendera quella intentione per se"; fol. 50 v–a, cited in Federici-Vescovini, 1980, 131). Compare Alhazen: "intentiones particulares faciunt pulchritudinem: etiam compositae similiter. Et est dicere: facere pulchritudinem, est inducere dispositionem in anima, videbitur, quod fit res pulchra, quae videtur" (*Thesaurus Opticae* 2.59). Leonardo and Ghiberti followed the vernacular tradition of Alhazen to maintain that the beauty of proportionality can be seen instantly, and the argument is central to Leonardo's defense of painting (see CN 13).

CN 18

The opening exhortation to "amate" to enjoy the poetic descriptions of nature suggests a scene from a prose romance like Boccaccio's *Filocolo*, where a beautiful garden is the setting for varied discourses on the theme of love: see Crane, 54 ff.; Comito). Many of Leonardo's own allegorical descriptions of nature fall into this category of description (Kemp, 1985; compare Bonaccorso da Montemagno, an early fourteenth-century Petrarchan poet popular in the fifteenth and sixteenth centuries who wrote in this scientific vein [see his "Belleze di Nature e Sensi d'Amore," cited in D'Ancona and Baccio, 1: 603]; on the tradition, see further, M. Rossi). Leonardo's remark that poems need interpreters calls to mind a medieval literary genre in which the author is both poet and glossator, as in Dante's *Vita Nuova* or *Convivio* (see further Neilson; J. Nelson).

Leonardo's concluding sentence, that the actions of paintings should be "well-proportioned to the mental accidents" of the figures is probably derived from Alberti and recurs many times in Leonardo's writings. More commonly, as in *Ms. A*, fol. 109v, ca. 1492, this formulation occurs in conjunction with remarks on decorous figure composition based closely on Alberti's precepts in *della Pittura* (*On Painting* 2.41–44 first suggested by Clark, 1944, 17; see also Pedretti, 1964, 132 ff.; Appendix 1). According to Alberti (2.41): "a *historia* will move spectators when the men painted in the picture outwardly demonstrate their own feelings as clearly as possible."

In *Ms. A*, where Leonardo considers "how the figure is not praiseworthy if the action does not appear to express the passions of the mind," he takes up Alberti's discussion of emotions in categorical terms such as "angry," or "melancholy" ("disperati"), or graceful. Many similar examples, based ultimately on the Hippocratic theory of the humors associated with Galen (Temkin, 104), are included in the *Codex Urbinas*, the majority collected in McMahon's arrangement as nn. 394–414. Not surprisingly, Albertian prescriptions also crop up in Leonardo's discussions of anatomy: W19037r, c. 1489; *Ms. L*, fol. 79, ca. 1502–1503; W19141, c. 1506–1508; W19101, c. 1510–1512; W19071, c. 1513; W19121, c. 1513.

In all three passages cited below, Leonardo identifies invention directly with the representation of figural movement according to the artist's "mental movements"—not, as Alberti did, with literary themes (*On Painting* 3.53). Variations of the present passage are preserved in the *Codex Urbinas*, fol. 130v (ed. McMahon, n. 430), where Leonardo writes that the attitudes of the figure are of greater excellence than the painted figure itself, because the movement of the figure must come about through the great *discrezzione* of the painter's *ingegno* (the source of this passage is unknown; Pedretti dates it c. 1508–1510). In another instance (fols. 61v–62r, ed. McMahon, n. 261), Leonardo compares the painter's method of composition to that of the poet: the painter must feel free to change his drawing to represent the thoughts and emotions of the figures. (Pedretti dates this passage ca. 1492; although it resembles *Ms. A*, fol. 102v, the reference to rainbows suggests a later date, ca. 1505; see further Gombrich, 1952). Perhaps Leonardo's clearest statement of the relationship between the artist's powers of invention and his figures occurs in a passage from *Libro A* (Carta 15.11; ed. McMahon, n. 437), ca. 1508–1510, in which he considers why figures often resemble "their masters." Judgment is a power of the soul that composes a body according to its will; therefore, judgment

willingly “makes again that body of which it was first the inventor; and from here it follows that whoever falls in love willingly, falls in love with things like himself.”

Leonardo's abrupt transition from painted landscape to figurative art in the present passage is perhaps understandable on the basis of the Aristotelian definition of “accidents” to encompass both animate and inanimate effects observed in nature. As several other passages in the *Parte Prima* elaborate, the “ornaments of nature” are the poet's *discrezioni*, identifiable with the “ten duties of the eye” originating in Aristotle's predicaments: these are the “accidents” or properties or qualities which the physicist studies in natural bodies. “Passions” or “mental accidents” in the individual soul of the artist are also such properties, as well as being qualities embodied in his figures. According to Leonardo's argument, poetry requires commentators to explain literary “effigies” of nature, but the proportionate movements and gestures of painted human figures make their mental states self-evident, and express the divine manifestation of nature according to the emotions implanted in the artist's *ingegno*. Thus, painted images are closer to the “truth” of nature than words because they reproduce the appearance of natural effects.

CN 19

The passage is excerpted from *Ms. A*, fol. 99r–v, ca. 1492. The notes to the reader cite corruptions and editorial emendations of the text, which show that the editor of the *Codex Urbinas* played an active role by modernizing orthography and verb tenses, and in one instance by changing Leonardo's syntax. The editor also emended one statement to create a more emphatic judgment against poetry. Chapter 19 is the most extensive comparison of painting and poetry in all of Leonardo's writings. The passage might be regarded as a catalogue of all the issues he addressed. The main subjects are the nobility of vision and the role of the common sense; the comparison of painting and poetry, based on the statement attributed to Simónides that painting is mute poetry; challenges to the poet to depict certain conventional themes (battlepieces, ideal women, devotional images, and invented fantasies described in antithetical categories, on the Homeric model of beautiful and monstrous subjects); the mechanical versus the liberal arts; moral versus natural philosophy; and the imitation of natural appearances (including the visible expression of mental movements). The only major theme not treated in Chapter 19 is the ability of painting to create a proportionality or “divine harmony.” This subject was developed

most fully in comparisons of painting and music, but it also occurs in comparison to poetry, and in other writings associated with the last ten years of Leonardo's Sforza period (see CN 27).

In its original context in *Ms. A*, the present passage is related to Leonardo's study of Alberti's treatise on painting (see CNs 12, 18; see Appendix 1). Leonardo studied Alberti's remarks on decorous figure composition as the *convenienza* of parts to unify the *istoria*, a concept of *convenienza* based on Ciceronian *concinnitas* (*On Painting* 2.41–44; on Alberti, see Baxandall, 1971; Wright, 1985; Zubov, 1960). In some cases, in *Ms. A*, *Libro A*, and elsewhere, Leonardo even followed the sequence of Alberti's chapters; but his remarks taken from Alberti are accompanied by criticism that sometimes alludes to problems encountered in applying Alberti's advice. This is particularly true of late echoes of Alberti in *Mss. E* and *G*, ca. 1510–1515. Alberti's comparison of the arts in praise of painting at the beginning of Book 2 of *della Pittura* is particularly relevant to the present chapter. Not only does Leonardo cite certain telling incidental details, such as the invention of painting (fol. 97v; compare Alberti, *On Painting* 2.26) and the *Calumny* of Apelles (fol. 99v [CN 19]; compare Alberti, *On Painting* 3.53), but he also repeats the major themes of Alberti's discussion.

The artist's powers of invention are the center of discussions recorded on a page adjacent to this comparison of painting and poetry in *Ms. A* (see Chapter 38, originally fols. 105v–104r). The terms of Alberti's comparison coincide closely with Leonardo's argument in the two passages. Both writers discuss painting as a liberal art that encompasses all other arts, the ability of painting to represent divinity and the divine power of human subjects, the value of the artist's manual labor as evidence of his mental powers, and the appeal of painting to a universal audience. However, Leonardo's argument also reflects other sources and the comparison with Alberti should be considered in light of a broader literary tradition. Leonardo's discussion calls to mind ancient literary descriptions that Alberti himself (*On Painting* 3.53 ff.) recommended to the painter to improve his inventions. Plutarch similarly praised the painted battlepieces of Euphranor when he cited Simonides' comparison of painting to mute poetry (*Moralia* 346F). Plutarch in the same passage also praised the superior ability of painters and historians, as compared to poets, to narrate emotions and characters vividly. His high regard for *enargeia*, or the ability of words to present actual events to the imagination of the audience, is also fundamental to Leonardo's defense of painting as the supreme form of imitation, and Leonardo's praise of painting for its ability to portray

the monstrous as well as the beautiful might be further associated with ancient praise for artistic invention. In another passage, Plutarch voiced his appreciation for artifice when he recommended that youths be taught to distinguish between that which imitates the beautiful and that which beautifully imitates ("On the Study of Poetry," *Moralia* 14D ff.). Accordingly, the artistic imitation of "unlikely events" of all kinds can be praised as "beautiful imitation" as long as the artist's techniques and skills are appropriate to the subject. In similar language, Alberti (*On Painting* 2.29) advised artists to devote themselves to the labors of perspective, that is, to master skills that require *ingegno*. In a passage from *Ms. A.* (fol. 97v, well known because it begins the abbreviated version of the *Trattato*), intermingled with other topics closely associated with Alberti's treatise, Leonardo paraphrased Alberti's counsel in a simple directive to the student to learn perspective: "Giovane debbe imparare prospettiva."

While the resemblance of Alberti and Leonardo to ancient writers like Plutarch is too diffuse to suggest an exclusive dependence of texts, both modern writers are indebted to ancient theories of *phantasia*. Alberti's immediate sources were primarily Cicero, Plutarch, Quintilian, and Pliny. Leonardo might have been inspired by Dio Chrysostom's *Twelfth Olympic Discourse* (*editio princeps*, 1444), for his defense of painting is in many ways a direct response to Chrysostom's defense of sculpture. Chrysostom explains how artists use artistry to make a true likeness of divine manifestations, yet neither painters and sculptors nor poets can represent natural marvels like the sun and moon and stars, or thunder and lightning. As Leonardo argues in many places, the supremacy of painting rests with its ability to present these ephemeral qualities of nature through the use of perspective. Chrysostom's argument continues by claiming that only the poet is able to implant emotions into the soul easily through words. Leonardo's defense of painting in Chapters 19 and 38, both excerpted from *Ms. A.*, combats precisely this argument. But other explanations for the resemblances are also possible, since Chrysostom's argument for a higher kind of *phantasia* than that which imitates natural appearances can be associated with writers beginning with Cicero, and especially with Christian metaphysics. Leonardo conceived of the painter as one who "transmutes" the forms arising in his imagination to "demonstrate the effects" of nature with such truth that they deceive both men and animals. The painter "transmutes" himself into the mind of nature and in so doing, *natura naturans*, is praised as being beyond the reach of art. Thus Leonardo claimed that painting is an act of demon-

stration, words only the “effects of demonstration.” He identifies the nobility of painting with the activity of the artist’s *ingegno* or *fantasia* on this basis: paintings do not merely portray appearances but correspond, with true *scienza*, to effects by which the painter demonstrates nature’s universal causing principles. Painting, by translating *fantasia* into *disegno* through the activity of the hand, is the likeness of God and the similitude of the beloved.

CN 20

In this passage the Horatian theme of painting as mute poetry, poetry as blind painting, introduces a *contrasto* between the senses of hearing and sight based on their respective abilities to enjoy beauty (compare Chapter 16). Poetic riddles may traditionally consider whether love arises in the suitor from sight of beautiful object. Leonardo’s remarks point beyond this courtly tradition, however, to Alberti’s theory of painting, in his final argument that a deaf person will be able to understand “every accident” of the human body. This statement is repeated in several other passages, together with discussions derived directly from Alberti’s prescriptions for achieving *convenienza* in composing the figures of the *istoria*, in Book 2 of the *della Pittura* (see further CN 19). Similar statements occur in *Libro A*, ca. 1508–1510, Carta 24.33 (*Codex Urbinas*, ed. McMahon, n. 403) and Carta 32.56 (McMahon n. 399), where the order of discussion follows Alberti closely (*On Painting* 2.41–44; noted by Pedretti, 1964, *sub numero*). As early as 1490, on CA 139 r–d (R. 593), Leonardo writes that the attitudes of painted figures ought to be the *concetto* of the mind, which the painter can study by watching the gestures of mutes (nearly the same remark occurs in *Codex Urbinas*, ed. McMahon, n. 248; and W12555r, c. 1490–1492).

It could be speculated that some of Leonardo’s drawings of grotesques also refer to the ancient rhetorical theory that, just as mutes communicate without words through gesture, gestural formulas used by the orator arouse the emotions of the audience in a kind of nonverbal elocution (Quintilian, *Instit. orat.*, 11.3; 6.2.32–34, on *enargaeia*). The enigmatic subject of the Windsor drawing, W12495, c. 1490, of four grotesque heads arranged around a male figure crowned with a wreath of oak leaves, might be a parody of an orator (or a preacher in the guise of an orator) with his deaf and mute companions. In Chapter 20, Leonardo claims that the painter can communicate the parts of the *istorie* with greater “nobility” because sight is the most noble sense. The “ten ornaments” identified with the poet’s discretions derive from Aristotle’s predicables by way of optical theory (see CN 12).

Leonardo had access to medieval rhetorical theory and Aristotelian terminology through vernacular poetry and optical writings (see Chapter Two). His interest in overlapping issues is also glimpsed in Chapter 12, where he identifies the poet's *discrezioni* with Aristotle's predicables in order to praise the superior ability of the painter to communicate. Leonardo's discussion of these "ornaments" as the "visual discourses" of painting, a science based on geometric optics, suggests further correlations with Giorgio Valla's theory of rhetorical invention or similar Quattrocento discussions. Although there is no proof that Leonardo read this material on rhetoric, he definitely studied other scientific writings in Valla's encyclopedia, which he owned (Reti, 1974, 3: 91, n. 1).

CN 21

This passage begins with the same comparison between painting and poetry as the previous one, but here the argument evolves into a defense of painting for its ability to demonstrate proportionality seen "at one and the same time." The simile that painting is mute poetry and poetry blind painting also occurs in Chapter 29 with specific reference to Apelles' invention of the *Calumny*, described by Alberti (whose source was Lucian; see Baxandall, 1971; Spencer, Introduction to Alberti, *Treatise on Painting*, 133–134; Meltzoff). Apelles' pictorial invention is also the theme here, but Leonardo is not, as Alberti was, concerned with literary embellishment. Instead he argues that painting creates a "harmonic proportion," in terms that are possibly indebted to Alberti's description of *compositio* as both the "fitting together" of surfaces observed in nature and *convenientia*, the ideal correspondence of members in an *istoria* based on a Ciceronian literary model of style (*On Painting* 2.33, 35–36). Alberti (2.35) associated the formal and figurative aspects of pictorial composition with the graceful and beautiful composition of a face created by joining together pleasing lights gradually with agreeable shadows without sharp angles. A similar description of the *gratia* of a face painted in relief occurs in *Ms. A*, fol. 100v. Alberti's definition of pictorial relief (*On Painting* 2.30 and 2.36) is indebted to ancient discussions of light and shade in painting in terms of its *splendore*, *asperitas*, *tonos*, and especially *harmoge*, the fitting and joining together of planes (Pliny, *Hist. Nat.* 35.29; see Pollitt, 150–151). These terms were also used in Hellenistic literary criticism, and the rhetorical concept of *harmonia*, derived from Pythagorean theories of proportion and number, was also associated with music and, by analogy, with poetry and architecture (Pollitt, 152–154). Leonardo's argument that painting creates

“harmonious proportion,” developed more fully in his comparisons of painting and music, may indicate that the present passage was composed after *Ms. A*. The argument is very similar to Luca Pacioli’s discussion of perspective as a liberal art, where Pacioli argues that perspective, like music, treats “divine proportion” (see Chapter Two; *Parte Prima*, Chapters 27 and 29).

In his discussion of the harmony shared by painting, poetry, and music Leonardo also praised *stupore* in terms suggestive of Scholastic discussions of beauty (see De Bruyne; Eco). An interesting precedent to Leonardo’s comparison of proportionality in painting with the temporal arts of music and poetry is suggested by Nicole Oresme’s adaptation of Alhazen’s discussion of visual beauty to the beauty of sound, “capable of being expressed as extensions of magnitude” (Oresme, 1968, 2.15–25, p. 325; see also pp. 28–39). Citing Boethius in *De Musica*, Oresme noted that in sensible sounds there is a “certain discreteness” brought about “by the interposition of pauses.” This also appears to be the basis for Leonardo’s criticism of music in contrast to painting: intervals of time between the parts of a poem in recitation, so that they do not compose a simultaneous configuration. Oresme, like Alhazen, insisted that the proportionality defined as beauty must be present in a single configuration, as in a single instant of sound. Leonardo knew Oresme’s treatise, *De configurationibus qualitatum et motuum*, although it is also possible that he independently construed the proportionality of sound as a spatial relationship of parts (compare Chapter 31; on his knowledge of Oresme, see Veltman). Music expressed in numerical ratios had been recommended to architects by Alberti on the basis that the laws of visual shapes (*figure*) depend on “the same numbers” that “fill the soul with pleasure” (*De re aedificatoria*, cited by Winternitz, 211–212, and see also, 205, comparing Leonardo to Alberti; compare Chapter 36, on contours in sculpture).

CN 22

Since this chapter repeats part of the argument presented in Chapter 19, c. 1492, Pedretti (1964, 178) justifiably dates the passage to the same period. Leonardo’s defense of painting is focused on the comparison of the senses of sight and hearing. He attributes greater nobility to sight for its greater immediacy and ability to apprehend nature. The argument generally follows Thomistic writers who defined the nobility of the senses according to their operations, but Leonardo’s view is colored by recent optical theory. Thomas Aquinas granted sight greater nobility than the other

external senses because sight is “without natural change either in its organ or in its object and is the most spiritual and perfect of the senses” (*Summa Theol.* Ia. 78.3). When Aquinas distinguished between spiritual and natural change in describing the functions of the senses, he described the operations of sight with respect to transmission of species through the medium. He claimed that light, unlike sound, which causes “percussion and commotion of air,” passes “spiritually” through the medium and does not cause any change in the organ of sense, as can be seen in the pupil of the eye, which is not colored by the color of light. Leonardo, by contrast, spent many years investigating the physical response of the eye to light in the dilation of the pupil (see Chapter Three), while Aquinas does not mention Aristotle’s observation (*De Anima* 431a18), repeated by optical writers since Ptolemy, that the pupil dilates because the “air modifies” it.

Leonardo’s devaluation of poetry, on the grounds of its limited ability to demonstrate things seen in nature stems from a related issue. His claim that painting is superior to words on mathematical principles departs from medieval views on the imagination to argue that actual images are preferable to literary descriptions. Yet in claiming that paintings stimulate the imagination with greater truth than mental images alone, he acknowledges the longstanding appreciation for the power of allegory to improve the soul by arousing mental images. Medieval writers held that the mental images of fiction aided the soul to grace through what Macrobius termed a “*narratio fabulosa*” (*Commentary on Scipio’s Dream* 7.9). In major respects Leonardo’s conception of the imagination agrees with that of his contemporary Gianfrancesco Pico della Mirandola. Although Leonardo never discussed immediate cognition through sight in metaphysical terms as Pico did, Pico similarly suggests that visual apprehension can result in instantaneous knowledge (Pico, 37–37; see the introduction to Section Two of the commentary notes; on Pico’s later criticism of Aristotle, see Schmitt, Introduction).

CN 23

This comparison of painting and poetry begins, like Chapter 19, with a reference to the process of vision. In both cases Leonardo explains how the inner senses receive similitudes of objects through the organs of the external senses. However, he introduces a new consideration here: that sense is “contended” by harmony. His argument follows Aristotle and medieval writers from Thomas Aquinas to Dante, that “a mixed constitution produces a better

harmony" because "sense is a ratio, and excess hurts or destroys" (*De Anima* 426a28–426b8; see also *De sensu et sensato* 439–440a; Cicero, *De natura deorum* 2.58).

Leonardo's argument that "the black of the eye immediately confers truth" about surfaces and figures "presented facing the black of the eye" alludes to Alhazen's theory that vision is "certified" mathematically when the "center line" of light imagined to extend from the object is perpendicular to the eye (compare *Parte Prima* Chapter 4). Also reminiscent of Alhazen is the argument that painting allows one to "see and consider" harmony for an extended period (compare *De Aspectibus* 2.59). If Leonardo does in fact allude to Alhazen's *intuitio*, which apprehends beauty and renders certainty on the basis of prolonged visual experiences, then his argument is a rare indication that he recognized that mental processes associated with vision are not instantaneous (compare CN 13).

Leonardo's argument is based on a perceptive model of knowledge. When he states that sight does "not impede reason from considering divine beauty," and that, together with touch, it supplies what the poet's *discretione* cannot, he differentiates between two stages in the process of vision. He seems to claim that the cognition of "divine beauty" is distinct from the sensitive appreciation of corporeal qualities—such as light and dark and their particular conditions like transparency—in other words, the ornaments of nature which are also the poet's *discrezioni* (see CN 20; the identification of sight with touch originates with Aristotle, *De Anima* 415a4). Leonardo asserts that all harmony is like a visual configuration. When he alludes to rhythm in poetry, he evidently means that poetry's rhythm should be defined in the same terms as visual proportion ("it is a sin against nature to wish to put by the ear what is put by the eye, to let the duty of music enter in place of the judgment of painting"). This reading is suggested by his following statement, that "painting is the true imitator by natural figures of all things in nature which move themselves,"—probably a reference to the soul, since the soul is traditionally defined as that which moves itself (Aristotle, *De Anima* 403–412, especially 404a2). Since harmony is a "blend or composition of contraries" and a body is composed of contraries (compare *De Anima* 407b27), Leonardo probably means that painting, by representing human figures, represents the harmony produced by the soul in the same way that nature does.

His polemic against music rests on a distinction between two kinds of harmony, both of which are continuous but only one of which is lasting. Geometry is the study of continuous quantity in

mathematical entities, which are eternal, while harmony in the physical realm perishes. This distinction underlies Leonardo's argument that the harmony sensed by hearing, which involves a succession of sounds created in time, is "as swift in dying as in being born." According to Aristotle, everything that "comes to be passes away will always be continuous" (*De gen. et corr.* 336b25). Harmony, by this definition, must be both continuous and eternal. However, midway in his argument, Leonardo switches to other definitions of harmony, alluding to a traditional neoplatonic notion of harmony as love that binds body to soul. When he claims that all the senses vie with sight, his argument derives from the courtly tradition of *contrasti*, founded on the theory that love originates from the sight of the beautiful. When Leonardo cites the poet who thinks that "with diverse fictions which feign that which is not, he makes men talk and reason," he also alludes to the principle of allegory or *integumentum*, that a "proportion" or harmony exists between poetic fiction and the truth that it veils. When he claims that "the science of painting considers human works as well as divine law," he refers on the one hand to the first principles of mathematics, on which perspective is based; and on the other to the "productive" mechanical arts. His list of the productive arts echo the seven canonized by Hugh of St. Victor (*Didascalicon* 2.20), but his references to "machinatori" and "ingegnieri" suggest more recent developments in line with contemporary humanist classifications of the arts and sciences. A similar account was given by Luca Pacioli, who also associated practical sciences with mathematics, considering them as "knowledge which geometry, arithmetics and proportion make possible" (*De divina proportione*, 1498, excerpted in *Scritti* 1: 62). Leonardo's conception of harmonic proportionality is closely related to Luca Pacioli's argument that musical harmony is analogous to perspective because both concern proportion (*De divina proportione*, Chapter 3, excerpted in *Scritti* 1: 63–65; see also Chapter Two).

CN 24

This eulogy to the eye combines two Platonic metaphors, the eye as the mirror of the soul, and the body as the prison of the soul, but Leonardo interprets both in an Aristotelian fashion. The image of the body as a confinement originates with ancient Pythagorean and Platonist writers. Plato seems to have been the first to talk about the "eye of the mind" as a mirror of the soul. He compared the soul to an eye, which, when resting on truth, is "radiant with intelligence" but when "turned to the twilight of becoming and perishing" has only opinions (see Bundy, 1922, 367, citing *Republic* 507).

Leonardo, by contrast, claims only that the universe is “mirrored in the eye” in the manner of an actual reflecting surface.

Perhaps the neoplatonic imagery of Chapter 24 simply derives from a widely disseminated tradition of love allegory. When Leonardo argues that *scientia* is dependent upon the experience of the senses, he conflates two kinds of “phantasma” that Plato distinguished in diametric opposition. The power of framing conjectures or “making shadows” is the “true imagination” by which science proceeds (*Republic* 524A; *Timaeus* 51E–52A; compare *Philebus* 39A–C). The “shadows of images” made by artists in the likeness of objects, however, like the phantasms seen in water or mirrors, result from sensation and resemble merely material reality (*Republic* 534C). Leonardo’s defense suggests that the science that the painter employs in the acquisition of knowledge is greater than either of these. Plato’s praise of corporeal vision in the *Timaeus* (45B–46E) begins in terms similar to Chapter 24: “sight in my opinion is the source of greatest benefit to us, for had we never seen the stars and the sun and the heavens, none of the words which we have spoken about the universe would ever have been uttered.” In a related passage, Cicero repeated Plato’s statement, also from the *Timaeus*, that man alone stands upright to behold the sky and so gain knowledge of the gods. After praising the structure of the eye, Cicero added, in terms close to Leonardo, that the sense of sight is able to judge “many things in the arts,” including painting, modelling, and sculpture (*De natura deorum* 2.56–58). Galen, also citing the *Timaeus*, had raised concrete objections to Plato’s linking of nobility of sight with stature, but he did emphasize Plato’s opinion that the body is ordered teleologically (*De usu partium*, Book 3, 160, citing Plato; and Book 10 [*On the Eye*], 468 ff.).

Praising the beauty of the created world, Augustine claimed that blindness shows that this “most excellent member” was created to see light (*De civitate dei* 22.1). Antithetical comparisons of life and death, pain and pleasure, and their metaphorical equivalents of light and dark, sight and blindness, were commonplace in the Augustinian tradition, so widely exploited in Petrarchan poetry. The bondage of the lover whose highest freedom is servitude to his lady is a familiar paradoxical conceit, as are antithetical images of death in life and life in death, both fundamental Petrarchan themes (see L. Forster, 13, 20 ff.; this topos is also used in Chapter 15).

The overriding metaphor of the chapter derives from the basic doctrine of neoplatonism, originating in Plato’s theory of recollection: the soul descends from its habitation in the “fixed spheres” into a mortal body which is a burden and source of distractions by

the senses. The attitude that the body is a prison was elaborated in the Middle Ages on the basis of Plotinus and others, especially Macrobius' discussion of the immortality of the soul in *Commentary on Cicero's Dream of Scipio*. (See Stahl, Introduction to Macrobius, *Commentary*, and 131 ff.; these ideas originate with Plato, especially *Phaedrus* 250C in connection with the idea that resplendent Beauty, the highest vision of the soul, is apprehended by reason alone.) Macrobius, glossing Cicero, who in turn imitated the Vision of Er in Plato's *Republic*, argues that life is really death: "for a creature to have existence, it is necessary that a soul be confined in the body. Thus you see that Cicero, by the words 'those who have flown from the bonds of their bodies as if from a prison,' means both that the body serves as fetters and that it is a tomb, being the prison of the entombed" (Chapter 11.3). Boethius, in the autobiographical *Consolation of Philosophy*, one of the most important models for medieval psychological allegories, described how he used the "inner light" of philosophy to recollect his "soaring thoughts" and thus overcome the desperate condition of his soul while he was imprisoned (Book 1, poem 20). Leonardo's argument on the deprivation of the senses belongs to a later phase of this theme. Alongside positive views of the artist's productive powers to imitate nature, from Augustine to Petrarch the theory prospered that perceptual distraction by sensual images blocks the soul from its meditations (see further Trinkaus, 6 ff.; Chapter 16 for Leonardo's mockery of this view). Leonardo's polemic recalls the dramatic tone of poetic "battles of the soul" in *contrasti*.

The distinction between the "accidental" and the "natural" in the last sentence of this chapter probably refers to two kinds of force: "natural" force is associated with the self-movement of the soul and the movement of heavenly natural bodies, such as the rotation of the earth, while "accidental" or "violent" force is the perishable, artificial motion of a moving object moved by a mover, that is, an impressed force or "virtus impressiva" (see CN 2). While Leonardo's reference in this chapter is too slight to suggest a more definite context, it is likely that he meant to refer to the capability of painting to represent two kinds of motion: the change of place that belongs to bodies by nature; and accidental movement, without change of place, as in the reflection of light (compare Aristotle, *De Anima* 406a; Leonardo frequently defined perspective with reference to motion beginning around 1497: see CN 9). The medieval impetus theory developed by Oresme, Buridan, and related sources known directly to Leonardo, Duhem notes (3: 369, citing *Ms. B*, ca. 1487), resembles the theory of the *Timaeus* that

every body tends to return to the element from which it was violently detached.

CN 25

Portions of this argument recur in Chapter 8, on the power of devotional paintings; and Chapters 18 and 19, on the license shared by painters and poets to invent delightful and frightening subjects, and to depict emotions or “mental accidents.” His boastful anecdotes are reminiscent of Pliny. Internal evidence suggests that Chapter 25 is no later than Chapter 29, ca. 1492. The tale, satirical in tone, that a painted “deity” aroused the lustful desires of its owner has sometimes been interpreted as an actual autobiographical account (Pedretti, 1964, 178), but the theme of sensual love for a work of art has a long literary history, best known in Ovid’s account of Pygmalion and already established in Athenian comedy (see Kris and Kurz, 22 ff.; compare Pliny, *Hist. nat.* 35.37.119–120). Leonardo’s outlandish claim that painting surpasses poetry in its ability to portray lewd subjects recalls Plutarch’s citation of the painter Chaerephanes, who depicted indecent intercourse between men and women, but Leonardo’s argument is somewhat different since he maintains that the artist’s skill and technique are praiseworthy apart from the painting’s moral content (other echoes of *Moralia* 14.1 occur in Chapter 19; see note *sub numero*). Leonardo’s praise of a painting that makes viewers yawn may be an original invention in the same tone of burlesque. His reference to the “accidente” of yawning follows another witticism, the concluding statement of his invective against poets in the preceding paragraph. In that sentence, “per ch’el pianto e’ maggior accidente che non e’l riso” might involve a pun on the word “accidente,” which could mean either an emotional effect or a mishap (see the Reader’s Note). Other invectives with burlesque overtones are Chapter 14 and the “Proemio series, especially R. 9, 10 (both CA 119 v–a, dated April 23, 1490), all early writings. Later invectives on similar topics, by contrast, such as the one against necromancy on W19048v (R. 1213), c. 1508–1509, are serious rather than frivolous. Polemics against the Arabic astrological doctrine of “prevision” are rhetorical commonplaces, however, and therefore Leonardo’s reference does not necessarily mean that he undertook mathematical studies related to astronomy at the time he wrote the passage, as Pedretti suggests (1964, 178; on conventional polemics against astrology, see Federici-Vescovini, 1979, 185, 188–202; compare Pliny, *Hist. nat.* 30.1, a similar castigation against predictions of the future, cited by Oresme, 1968, 339).

Leonardo's statement that painting and poetry are both concerned with "invention and measure" is unusual; these categories are not found in Alberti's treatise on painting or neoclassicizing rhetorical theories based on Cicero and Quintilian's five-part procedure for composing (invention, disposition, elocution, memory, and delivery). The anomalous category is *misura*, which may derive from musical theories of composition based on rhetorical principles or medieval rhetorical theories that list invention as the first step and add the *ars rithmica*, mathematical principles for patterning clause endings used in composing letters and hymns. There are also artistic precedents for Leonardo's scheme: for example, Ghiberti used "misura" to mean proportion (see CN 38). Boethius, who called the composer a "poeta" or maker, provided the foundation for medieval theories of music based on harmonic proportion. According to Johannes Grocheo, who described the compositional procedures of music around 1300 in terms that were still valid in the fifteenth century, the artist first receives the text or subject matter of his music and then applies to it the appropriate form (cited in Lowinsky, 1964, 478).

The same procedure was echoed by Giovanni Spartaro in 1529, and later by his associate Pietro Aron, a Florentine theorist, both of whom compared the individuality of musical talent to that of the sculptor. Aron, writing in 1545, clarified Grocheo's text: "each one of [our composers] knows the material, i.e., the musical intervals, and gives them a fitting harmonic form which differs in excellence, in sweetness, and loveliness according to the composer's individual skill and natural grace" (Lowinsky, 1964, 483, citing *Lucidario*). Similarly, Giovanni Battista Doni in 1544 compared poets and orators to composers who "take the *cantus firmus* or subject from others, and weaving it over an artful concept, draw various melodic lines from it" (*ibid.*, 338).

Doni's description was meant as negative criticism of an outmoded method that stifled musical invention, but for this very reason his testimony provides useful information about procedures common in Leonardo's day. Leonardo's reference is in any case not specific enough to establish a conclusive relationship to a particular procedure, but it might be suggested that he referred to methods practiced until about 1500 that proceeded in two stages. The *cantus firmus*, a text such as a chant, is the basis for inventing the melody; and the polyphonic harmony elaborated for several voices is the embellishment, or "artifice" in "rhythmic modes and measure" (Grocheo, cited by Lowinsky, 1964, 490; on composing techniques, see Lenaerts, 64). New practices that simplified complex rules of

rhythmic structure in favor of an expanded tonal system and relegated the *cantus* to the background appeared in the later fifteenth century with Johannes Tinctoris and Josquin de Prez.

New techniques of composition, far from minimizing the role of rhetorical theory, developed together with the humanist tradition. By the mid-sixteenth century, discussions of music, based primarily in the language of Quintilian, held that the power of music lies in ornament that arouses the audience to various passions (Palisca, 39 ff.). Furthermore, writers on music were among the first to value "natural instinct" (Lowinsky, 1973, col. 312b ff.). Lowinsky points out that Renaissance writers appreciated the musician's natural gifts as a kind of gifted inspiration practiced with extensive technical skill, a concept that is antithetical to Platonic *furor poeticus* but closely resembles Leonardo's conception of the painter's powers.

For Leonardo, the relationship between measure and invention concerned the painter's unsurpassed powers of *ingegno*, for painting "clothes" mathematical sciences while poetry is "clothed" by them. In other words, painting is based on the first principles of geometry, which provide "measure" or "proportion." Poetry is inferior to painting because it uses mathematical sciences merely as embellishment. The partnership of invention and "measure" ultimately originates with Aristotle. Thomas Aquinas established connections among a broad range of sources when he defined the powers of the *cogitativa* as judging sensible things by comparing, adding, dividing, reminiscing, and inferring (i.e., using "a kind of syllogism for the sake of inquiry." The *cogitativa* compares individual "intentions" to discover their causes; *Summa Theol.* Ia. 79a; see Klubertanz). Aquinas cited Augustine's discussion of *mens* (mind, from "measure") in which the mind seeks to discover itself as it really is through a process of *disputatio* and discovery (*invenitur*) that unfolds in three successive images (Gilson, 1983, 354, n. 10). Aquinas also cited John of Damascus, who defined the difference between *intentio* and *inventio* by illustration: the accidental concurrence of two causes originating in a deliberate choice but resulting in something other than what was intended, is like digging a grave and discovering (*invenire*) treasure (John of Damascus, *De fide orthodoxa* 2.25.2). The *cogitatio* or *discretivo* apprehends truth (called *intellectus*) through learning or natural *ingenium*, rather than sensation (*ibid.*, 2.20.2). Aquinas also cited Aristotle's distinction in the *Metaphysics* (981b–982) between the "mechanic," or man of experience, and the artist or "master-builder," who is admired not only for his useful inventions but also for his wisdom about causes and first principles.

CN 26

This exchange between poet and painter is reminiscent of King Matthias's objections to the poet in the following chapter (see CN 27 for discussion of dating). The argument that words are "accidentals" and the works of man, in contrast to the works of nature, recurs in Chapter 14. The case was made by Hugh of St. Victor, who argued that words have arbitrary meanings: words are made only by man while "things have their meaning from nature and the act of God" (see CN 14).

The rhetorical form of argumentation in Chapter 26 echoes Aristotle's followers who applied his theory of scientific demonstration of causes to rhetorical argumentation, that is, proof leading to opinion. Boethius, for example, included the four causes (formal, final, efficient, and material) under the category of "intrinsic topics" (*De topicis differentiis*, Book 4; see Stump, ed., 239). There is substantial agreement among different theories of rhetorical argumentation derived from Aristotle. Even though the terminology varies slightly from one author to the next, the general structure of Leonardo's argument can, for didactic purposes, be analyzed according to Boethian terminology. Argumentation begins by taking a topic, known in terms of its *differentia* as the major proportion. According to Boethius, a "genus" or "species" is predicated about the *differentia*, according to a pair of opposite characteristics. For example, "substance," the highest "species" in Boethius' scheme, can be divided into the opposite characteristics of corporeal and incorporeal substances.

Leonardo's argument in Chapter 26, analyzed in Boethian terms, begins with the topic, "the virtue of art," whose *differentia*, "cause" (of virtue), is divided into "species" of cause: "final cause," i.e., the production of art, and "efficient cause," i.e., the maker or artist. Leonardo (in his role as the painter) claims that the poet argues that the value of his work should be judged by "final cause" rather than "efficient cause" ("impute the virtue . . . to the thing which the painting presents"). Leonardo accepts this proposition as the *differentia* of the next argument, which accordingly begins with a consideration of "final cause," i.e., the product of art. The *differentia* for this topic is the "species" of imitation, divided into the contraries of "word" and "image." Image is judged to be the better member of the species with respect to the imitation of nature because it resembles nature more closely ("yet nature favors the painter more"). This argument is the turning point of the entire passage, as is attested by the next argument, which switches from

“species” of imitation to “species” of artist (“the works of the favorite deserve more honor . . .”). This switch assures a conclusion in the painter’s favor, on the grounds (just admitted) that the images of nature are better than the words of man. The painter is judged to be the better member of the “species” of artist because he produces images. This judgment returns the topic to its initial general consideration of the “cause” (or virtue) of a work of art—in favor of the painter.

Many of the arguments in the *Parte Prima* are constructed according to the same rules of rhetorical invention, and many of them argue from causes. Chapter 37, for example, invents a series of arguments from similar *differentiae*: cause is divided into “efficient” and “material” in this case and Leonardo argues, to the converse of the present polemic (argued from “final cause”) that “efficient, cause” is the cause of virtue in a work of art.

CN 27

Before the death of King Matthias in April 1490, his illegitimate son Johannes was engaged to Bianca Maria Sforza, from 1489 to 1490, probably the period during which stucco relief portraits of father and son were added to the choir of Ste. Maria delle Grazie in Milan (*Matthias Corvinus*, n. 88). Chapter 27 probably also dates from that period, even though the arguments recur slightly later in Chapter 19, excerpted from *Ms. A*, c. 1492. A key argument in Chapter 27 that is missing from Chapter 19 concerns the proportionality generated by a visual image. Although this discussion suggests Leonardo’s studies of problems of commensurability, begun with Luca Pacioli around 1496, the argument is based on Alhazen (*De aspectibus*, 2. 59), which Leonardo may have known by 1489–1490 (see Chapter Three). Although Leonardo elaborated the theme later, in terms closely resembling Pacioli’s praise of “divine proportion,” Chapter 27 suggests that Leonardo developed ideas about the relation between musical and painterly proportionality independently of Pacioli, years before they met at the Sforza Court, possibly through contact with Gaffurio (see Chapter Two).

The humanistic interests of King Matthias included an extensive library and exchanges with *litterati*. The anecdote told by Leonardo is on the order of a set piece and is probably a tongue-in-cheek embroidery based on the fame of the Hungarian ruler’s acumen in both visual and literary arts (see further, Chapter Two). A number of Italian humanists, including Lorenzo de’ Medici, Ficino, Poliziano, and Poggio Bracciolini, corresponded with Matthias and members

of his court. Others, including the Milanese Filelfo, and also artisans and painters, visited Hungary (see *Matthias Corvinus*, 81, 104, 134, 456, nn. 290–298; see also *Bibliotheca Corviniana*). Poliziano even wrote a polemic addressed to Matthias praising history and painting over architecture (Chastel, 1959, 210; see further, Meltzoff).

As a type of courtly entertainment the present chapter can be compared with Castiglione's polemics on painting, poetry, music, and sculpture, in his *Il Cortegiano*, and with Angelo Decembrio's disquisition on painting, *De politia litteraria*, complete by 1462 (see Baxandall, 1963, 91, also citing records left by Lorenzo Valla and others). Castiglione was retained by the Sforza Court from 1496 to 1499 and began his book less than a decade afterwards, while Decembrio studied rhetoric with Barzizza in Milan and spent the 1440s commuting between Ferrara and the Milanese Court, so correspondences among the three writers concerning the relationship of artifice to truth may be due to a direct transmission of humanistic arguments to Leonardo. Leonardo argues that the science of painting is a form of imitation superior to poetry because painting creates a "harmonic proportionality" simultaneously perceived, which makes the subject of painting a "true daughter of nature" worthy of the noble rank accorded to the liberal arts (compare Chapter 26). Castiglione composed an extended discussion of the differences between judging the universal nobility of a subject and judging a particular painter (*Il Cortegiano*, Book 1). His interlocutors deliver an invective against sculpture; when they discuss painting, the science of proportion, they determine that the painter can do things that the sculptor cannot. Because of this special expertise, the painter, even more than the poet, can perfectly discern all kinds of beauty. Claiming that painting, by its science, extends "beyond the reach of art," both Leonardo and Castiglione bring to mind ancient precedents for the praise of artistic skill and invention to rival nature, by Philostrati and Plutarch, or Pliny in praise of Apelles, or Dio Chrysostom's *Twelfth Olympic Discourse* (see CN 19). Leonardo concludes his entire discussion of proportionality on this note, claiming that painting can outdo the other arts because it exhibits not only the [actual] works of nature, but also "infinite [others] which wait for nature ever to create them."

Many of the same themes appear in Decembrio's discussion of painting, chiefly the notion that "the artifice of Nature is supreme" (cited in Baxandall, 1963, 314 ff., from *De politia litteraria*, Book 6 Pars 68). Decembrio argues that the *fantasia* of the painter should

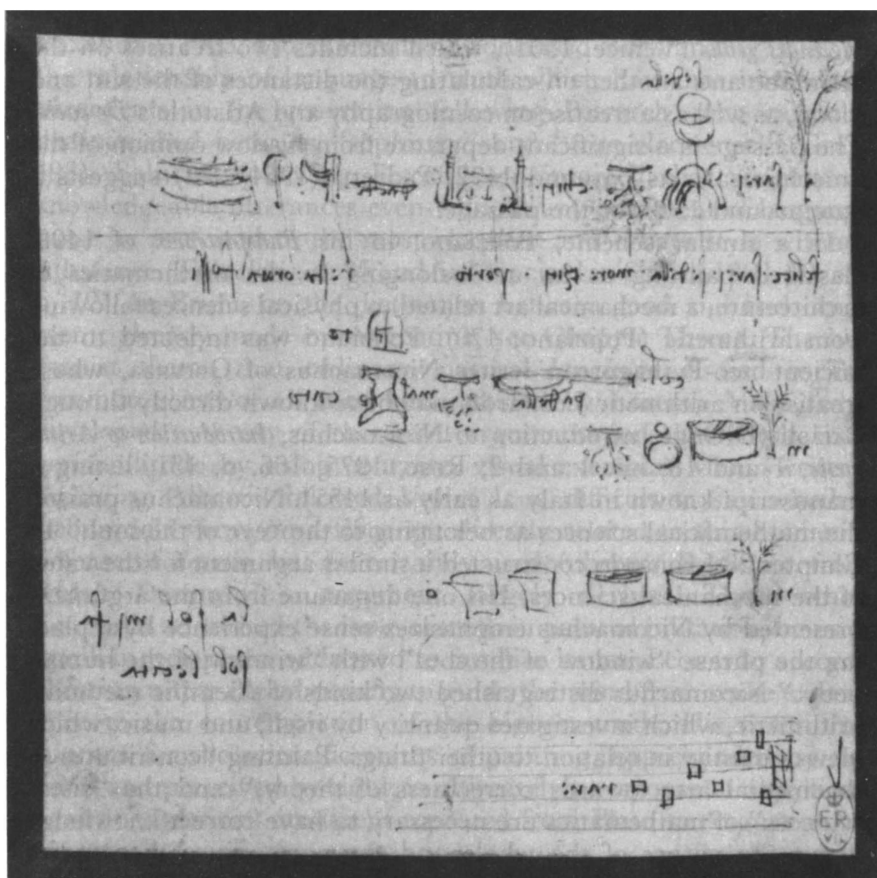
be restricted to the “natural order of appearances,” and he concludes that the same principle of *ingenio* underlies painting and poetry, for they both tend towards the same end by conforming to nature. The unifying thread of this discussion is the distinction between different kinds of artifice. “Everything in poetry and painting is naked,” whereas false ornamentation, like “period fashions,” appeals to the extravagance of princes and the stupidity of crowds by means of colors and lines without proportion (cited by Baxandall, 1963, 316). Decembrio addressed longstanding issues in the relationship of language to truth which have had immediate precedents in the generation following Petrarch, who carefully distinguished between “sophistry” and “true eloquence” (Gray, 498). Salutati, following Petrarch, maintained that weighty or knowledgeable utterances even without any ornament of language must be preferred to the most eloquent and ornate style without substance (*Epistolario*, 4: 35 and 5: 135; cited in Seigel, 1968, 90; see p. 121 on Bruni, on the distinction between good and bad ornament, already made by Augustine; see Chapter Three). The humanist theme that ordinary, natural language is tied to the common sense of all men was justified by Lorenzo Valla, who developed a theory of rhetorical argumentation that emphasizes verisimilitude by using concrete, visual exempla. Many writers, including Alberti, followed Valla. It is difficult to say whether Leonardo’s views on artifice are directly related to this humanist defense of *elocutio*, but he certainly used Alberti’s *De pictura*, from which Decembrio’s argument largely derives. Thus, when Leonardo addressed the issue of truth in painted imitation, he used familiar metaphors addressed to familiar issues. Leonardo accords painting unparalleled powers to guide the mind from sense experience to the contemplation of the highest truth. His overriding concern for the scientific status of painting, apprehended by the mind and perceived by sight, is ultimately a response to objections against superficial ornament repeated from Plato to Augustine.

CN 28

This passage reflects new appreciations for applied science at the end of the Quattrocento. There are interesting contemporary parallels to Leonardo’s discussion in Pacioli’s dedication to the *De divina proportione*, based on Valturio’s treatise on military instruments and a similar argument by Francesco di Giorgio (excerpted in *Scritti* 1: 62). Leonardo actually lists the productive sciences twice in this passage. The second time, when he mentions the

discovery of fire, agriculture, and “delightful gardens,” his categories recall the traditional mechanical arts according to the scheme of Hugh of St. Victor; but the first time, when he praises the human arts that “generated architecture, perspective, and divine painting,” including astrology, cosmography, and navigation (the science that “moves men from east to west”), his categories reflect current trends in the practical sciences. Leonardo’s emphasis on these sciences mirrors Giorgio Valla’s encyclopedia, *De expetendis et fugiendis rebus* (Venice, 1501), which includes two treatises on the astrolabe and another on calculating the distances of the sun and moon, as well as a treatise on cosmography and Aristotle’s *De caelo*. The passage is a significant departure from his low opinion of the “mechanical arts” around 1492. Pedretti (1964, 278) suggests a date around 1500 for the passage.

In a similar scheme, Poliziano, in his *Panepistemon* of 1490, classified painting as an art belonging to the mathematics of architecture, a mechanical art related to physical sciences following from arithmetic (Poliziano, 470). Poliziano was indebted to the ancient neo-Pythagorean writer Nicomachus of Gervasa, whose treatise on arithmetic Leonardo may have known directly through Pacioli (D’Ooge, Introduction to Nicomachus, *Introduction to Arithmetic*, 1 and 18, nn. 1 and 2; Rose, 1975, 166, n. 131, listing a manuscript known in Italy as early as 1455). Nicomachus praised the mathematical sciences as belonging to the “eye of the soul.” In Chapter 28 Leonardo constructed a similar argument for the value of the mechanical sciences. His one departure from the argument presented by Nicomachus emphasizes sense experience by replacing the phrase “window of the soul” with “window of the human body.” Nicomachus distinguished two kinds of scientific methods, arithmetic, which investigates quantity by itself, and music, which views quantity in relation to other things. Painting “contributes to the menial arts towards correctness of theory,” and the “sister sciences” of mathematics are necessary to have correct knowledge about the nature of the whole and the parts, since the studies apprehended by sense are bridges or ladders from physical matter to the mind and understanding. Nicomachus cites Plato’s *Laws* (Book 13) and Socrates’ defense of sciences “useful to human use” in the *Republic* (527D), he delineates practical studies derived from the quadrivium (farming and navigation), and puts the following argument into the mouth of “Socrates”: “Yet you amuse me, because you seem to fear that these are useless studies that I recommend; but that is very difficult, nay impossible. For the *eye of the soul*, blinded and buried by other pursuits, is rekindled and



Ill. 22. Leonardo da Vinci. Sheet of picture writing, including musical notes.
c. 1487–1490. Pen and ink. Windsor, Royal Library W12699.

aroused again by these along . . . eyes, for by it alone is the truth of the universe beheld” (Nicomachus, 286; emphasis added).

Chapter 28 is the concluding passage of the second section of the *Parte Prima*, with the exception of Chapter 46, misplaced by the editor of the *Codex Urbinas*, as noted on folio 28 recto of that manuscript (see Reader’s Note).

SECTION 3

Comparisons of Painting and Music, Chapters 29–32

There are no polemical comparisons of painting and music in Leonardo’s extant manuscripts. This lack of evidence makes dating of the passages in the *Parte Prima* difficult and, consequently, the relationship of the polemics against music to Leonardo’s other writings is relatively obscure (see further, CN 31). The polemics concerning music are to a large extent identical with those against poetry; most of the arguments are given in Chapter 27, an invective against poetry, and Chapter 29, the first passage comparing painting and music. The central argument is that the “harmonic tempo” of music is ephemeral, while painting endures for many years.

Important precedents for Leonardo’s arguments are comparisons of the objects of the senses in Aristotle’s *De sensu et sensato* and *De anima*. When Aristotle compared the senses (442a–b, for example), his analogy was structural. All things in the sensible world are known as ratios of contraries proper to the sense perceiving the sensation (*Metaphysics* 991b); and all sensate knowledge is engendered by the one universal principle of harmony, sensed as a pleasing ratio. Beauty is perceived by the senses of hearing and sight (*De anima* 418a10). Questions related to this are taken up in commentaries on optics by writers like Biagio Pelacani, who discussed the same issues in his commentary on *De anima* as he did in his commentary on perspective (Federici-Vescovini).

Around 1497 Luca Pacioli recorded an argument in his treatise *De divina proportione* for the liberal status of perspective used by painters by comparing it to music. The same argument in nearly identical language is made by Leonardo, who claimed that perspective should be included among the sciences of the Quadrivium along with music. Pacioli based part of his discussion on Piero della Francesca, but he also associated geometric proportion with the neo-Pythagorean tradition of harmonic proportion, independently of Piero, and turned a Scholastic argument for admitting perspective to the Quadrivium into an original comparison of the liberal

sciences of optics and music. In *Prospectiva pingendi* (ed. cit., 128–129), in terms similar to Chapter 9 of the *Parte Prima*, Piero defined perspective as necessary to painting because it “discerns all the quantities proportionally as a true science, demonstrating the degradation and increase (*degradare et ascescere*) of every quantity by the power (*forza*) of lines.” Leonardo’s defense of painting as perspective resembles Piero’s (compare *Parte Prima*, Chapter 9), but his argument against music is based on a conception of “harmonic proportionality” nearly identical to Pacioli’s. Leonardo’s use of the term “divina proportione” must indeed be directly associated with Pacioli, for whom the same term defined the Pythagorean “golden section.” Their shared ideas on proportion may be indebted to Gaffurio and other contemporary musical theorists and must be founded on Vitruvius (see Chapter Two), whose treatise on architecture was the primary means for transmitting to the Middle Ages and Renaissance the classical Greek definition of harmony in terms of spatial magnitude. Vitruvius identified geometric proportion in architecture with both music and nature. Alberti, who elaborated upon Vitruvius’s discussion of proportion, compared the beauty of “perfect number” in art and nature (Vitruvius, *De architectura* I.1; compare Alberti, *De re aedificatoria* 9.5–6).

Despite these similarities among Leonardo’s predecessors, however, none of them argued, as Leonardo adamantly did, that the proportion pertaining to perspective is superior to that of music. In Chapter 29, for example, Leonardo claimed that painting is superior because its “harmonic proportionality” depends on simultaneous perception, rather than sequential perception as happens with sound. Leonardo’s arguments against music imply that “harmonic proportionality” is an intelligible structure, immediately perceptible to the sense of sight. The terms of his comparison may have been suggested in part by Alhazen’s theory that beauty is a “proportionality” that must be apprehended in a single configuration: that is, a proportionality expressed as an extension of magnitude is apprehended through the sense of sight (*De aspectibus* 2.59). Alhazen did not, however, explicitly limit proportionality to harmonic ratios.

Commensuratio was identified with both perspective and music by a number of Leonardo’s contemporaries, including Piero della Francesca and Luca Pacioli (see CN 31). Leonardo’s ideas in this area perhaps derived from musical theory based on Boethius, whose *Institutio musica* defined *commensuratio* as the arrangement of shapes and volumes. The term *commensuratio* was used widely in the Middle Ages. Roger Bacon defined rules for beauty in Pythagorean

terms taken from Boethius, as did Robert Grosseteste, and Alhazen's discussion of beauty was ultimately based on the same classical Greek mathematics. It has recently been suggested that Gaffurio's similar theories of musical harmony are embodied in Leonardo's *Last Supper* (Onions, 1988, 232). In the late fifteenth century, the musical theorist Gaffurio reinforced the connection between optics and music by comparison to painting (see Boskovitz, Part 2, 133–149; on Leonardo, Gaffurio and architectural theory, see Chapter Two). Lowinsky maintains that musical theorists, beginning in the late fifteenth century, valued novelty and innovation in the simultaneous (rather than successive) composition of parts in a harmonic complex (1973, 315, citing Tinctoris and others; see further, CN 25). Artistic license in music theory, then, refers to the free polyphony of contrapuntal elaboration. In Chapter 30 Leonardo discussed variety in music in terms that bring these developments to mind, when he argues that the beauty of the parts in musical harmony "has to be varied in order for one figuration to lead to another." That is, *varietà* in polyphony (the harmony composed by voices) changes from one sound to the next. Leonardo argued that, therefore, the power of invention required by the painter, poet, or musician, when compared (*equiparata*) in universal terms, shows the painter to be superior: while all achieve the same varied beauty of harmony that leads the soul to grace, the painter's work is more enduring (it is not the "body composed," nor the "beauty which has to be varied," that is important, but making "beauty permanent").

In Chapter 30, Leonardo also called upon another set of associations when he referred to "equiparanza," a term that he defined elsewhere as "the mode of being able to give the value of the same portion [a circular segment] in different figures that never deviate from a single curved side" (CA 128 r-a). Leonardo had planned for many years to write a treatise on the subject, which he designated by various terms such as the "equazione," "transformatione," or "transmutatione" of curvilinear elements. His interest in geometry, in fact, has been characterized as centering on this problem of commensurability (McCabe, 121). His study of the quadrature of curved figures is directly related to his studies of light and shadow on curved surfaces, and these studies must have reinforced Leonardo's conception of harmony, in geometric terms, as a visual configuration.

Leonardo's analogies between sound and light, as objects of the special senses of hearing and sight, are rooted in his investigations of motion. Leonardo's concept of degree (*grado*)—an important

term in his comparisons of music and painting—seems to have derived from impetus theory, where *gradus* refers to “degree of speed.” Scholastic scientists attempted to quantify motion as a “calculus of ratios” (to cite the thirteenth-century pioneer of the Merton School, Thomas Bradwardine). Walter Burleigh, whose treatise on the intension and remission of qualities Leonardo probably owned (Reti, 1974, 3: 93, n. 10), followed Jean Buriden in this tradition by defining successive motion as change from instant to instant so that change of motion could be measured on the basis that each instant is a “permanent quality” (Nicole Oresme, a source known to Leonardo, expressed similar views, as discussed in the introduction the Commentary Notes on poetry). Leonardo’s concept of degree is also indebted to medieval pharmacology, where *gradus* was likewise defined in terms of geometric ratios. From medicine the concept was extended to discussions of sensory effects (Murdoch, 224–227, citing the example of Bradwardine). Leonardo may have known these medieval medical discussions, and he definitely knew treatises in the tradition of the Merton School on composed ratios in mechanics and astronomy, by Jordanus de Nemore and Biagio Pelacani (see Duhem; Uccelli).

Other historical arguments also linked judgment by the senses of sight and hearing. There are precedents to Leonardo’s position against music in early humanist defenses of eloquence. Coluccio Salutati, for example, criticized superficial ornament that lacks substance, in an argument that is ultimately indebted to Aristotle’s *Poetics*. Salutati criticized superficial ornament in poetry, by comparing it to music: “for mere melodious trifles pass through the ears and, like musical instruments, when they cease to resound leave nothing remaining” (*Epistolario* 3: 169; cited in Seigel, 1968, 78). Later writers continued to associate the categories of rhythm and melody, as embellishments appropriate to various kinds of style, with their counterparts in the visual arts. Cicero, one of Salutati’s immediate sources, distinguished the “charming (*suavitas*) kind of style” from “brilliant style” in musical terms, preferring the pleasing eloquence of words, associated with the “suave” style for its smooth and sonorous effect on the ear (*De part. orat.* 6.20–21). Quintilian defined the suave or smooth style in similar terms except that, instead of calling upon musical analogies, he described composition by comparing it to sculpture—the continuous curve of Myron’s *Discobolos* imparts the graceful effect of motion analogous to language that departs from ordinary usage (*Inst. orat.* 2.8.9–11; on the significance of this passage to Renaissance discussions of

pictorial composition, see Summers, 1977; 1972, 277, with reference to Leonardo). These writers were in turn indebted to Aristotle who distinguished the various poet arts, including music, according to their different means of imitation: flute-playing depends solely on the combination of harmony and rhythm, for example, while prose and verse imitate by language alone, without harmony. In arts such as tragedy, where different parts are combined in the whole work, rhythm and harmony or song are “pleasurable accessories” super-added to the imitation of an action (*Poetics* 1449b623).

Ancient theory based on Aristotle treats harmony as superficial beauty, an “accessory ornament.” Leonardo departed from that tradition, however, in the great importance he attached to “harmonic proportionality,” not merely as embellishment, but as a structural principle. In the latter portion of *Ms. A*, c. 1492, Leonardo had already established the argument that the painter is not praiseworthy if he is not universal. Following Alberti’s precedent (*On Painting* 3.60), he defined universality in painting as that which appeals to a universal audience. But Leonardo also meant that the painter should ornament his works on the theoretical foundation of geometry. In Chapter 31, he claimed that “harmonic proportionality” is achieved only when the whole and its parts can be apprehended simultaneously (“in un medesimo tempo”)—in contrast with music, where proportionality passes away instantly (because of the mode in which sound is perceived by the senses). In painting, that which is perceived instantly also endures. His ideas have contemporary parallels in rhetorical theories of invention. Giorgio Valla, for example, described the “poetic arts” of persuasion as “bound together by their essential *armonia*” (*De expetendis et fugiendis rebus*, fol. FFiv; see Vasoli, 1968, 260). In Chapter 31, Leonardo argued that the importance of “harmonic proportionality” is that it allows the viewer to judge the “sweetness” of the whole composition as well as its component parts. He apparently meant that the enduring value of a work rests upon its essential mathematical structure, its “sweetness” apprehended through the senses, and enjoyed during a period of contemplation. Painting demonstrates, not merely the semblance of truth through its appearances, but harmonic (i.e., geometric) structure.

The special capabilities of the spatial (as opposed to temporal) mode of communication occupied Leonardo to the end of his life. His study of anatomy, specifically Galen, is an important key to this continued interest, exemplified by his stereometric drawings of anatomy. Galen defined medicine as a productive art on the

foundation laid by Aristotle, arguing that the design or structure of the human body is ideally suited to its actions. This argument, which also underlies Vitruvius's conception of proportionality, was developed in Aristotle's discussion of design, or composition, in *De partibus animalium* (on Galen's debt to Aristotle, see May, Introduction to *De usu partium*, 10). According to Aristotle, the works of the physician, the natural scientist, and the carpenter building a house all proceed in a "twofold process" analogous to that of the geometer who analyzes a geometric construction (see below and also *Nicomachean Ethics*, 1112b22). This theory of demonstration, which is the basis of all later discussions of method in medicine and natural science, which in turn underlie artistic discussions even before Leonardo, rests on the premise that nature is designed on the universal principles of geometric harmony (see CN 32). Aristotle theorized that it is necessary to begin with the idea of the final object to be realized, the design or composition, and then to realize the necessary steps for its production in a continuous succession until the final result is reached; the counterpart to the plan is its actual construction in the physical world (*De partibus animalium*, 643b33–640a18). According to this theory of scientific demonstration, which Aristotle also applied to productions in art, intuition (*nous*) is identified with both the beginning and the end of the reasoning process concerned with particulars. The main issue in Aristotle's argument, which is also at the core of Leonardo's defense of painting against music, is the right relation of theory to practice.

CN 29

Chapter 29 is reminiscent of studies of acoustics related to CA 360 r-a, ca. 1504, where Leonardo discusses persistency in sounds and images with reference to musical harmony: "... one tone cannot create any harmony, and consequently any song whatsoever occurring alone would seem to be devoid of grace. . . ." Around this time Leonardo formulated a definition of the hierarchy of the sciences that includes music as "born of continuous and discrete quantity, dedicated to the ear, a sense less worthy than the eye"; and, further, he compares the "concento" of music to the "refrAGRANCE" of odors (*Madrid Codex II*, ca. 1503–1505, fol. 67r).

The analogy between "harmonic tempos" in music and the "circumferential line" in painting is based on a comparison of the proportionality of objects of the senses (compare Chapter 39, that profiles should encompass things "according to the rules of proportionality"). Like the statement about "concento" in *Madrid Codex*

II, this analogy suggests how Leonardo developed comparisons of the arts out of scientific comparisons of the senses.

When Luca Pacioli defended perspective as a liberal art, in his *De divina proportione*, completed ca. 1498, he praised Leonardo's paintings and argued in the same terms as Leonardo does in Chapters 29, 31, and 32 that either perspective should be included among the sciences of the quadrivium, or else music should be eliminated. Pacioli's argument may be indebted to Piero della Francesca whom he knew before he met Leonardo. Piero had redefined Alberti's category of "compositio" (*On Painting*, Book 2) in more abstract, mathematical terms, by treating proportion in perspective under the heading "commensuratio" (Davis, on Pacioli's relationship to Piero; Baxandall, 1985; Elkins). Pacioli extended Piero's discussion of proportion in mathematics to consider harmonic proportions expressed geometrically.

Pacioli's comparison of perspective and music, by focusing on proportion, turned a Scholastic argument for including perspective as part of the Quadrivium into a polemical comparison of music and painter's perspective. Following Scholastic precedents, he wrote that music contents the ear, one of the natural senses, while perspective contents the sight, a more worthy sense because it is the "first door of the intellect" (*De divina proportione*, Chapter 3, excerpted in *Scritti* 1: 62–63). Music, according to Pacioli, extends to "sonorous number" and measure carried in the "prolongations of time," while natural number extends to the measure of visual lines. Music recreates the mind (*animo*) by harmony, just as perspective [used in painting] does by establishing proper distances with a variety of pleasing colors; and just as music considers harmonic proportions, so perspective in painting considers arithmetic and geometric ones.

Leonardo's defense of painting against music is less specific, but his description of "harmonic proportionality" is nearly identical to Pacioli's. Despite these close connections, Leonardo was apparently the first to argue that "harmonic proportionality" must be perceived simultaneously. The terms of this comparison may have suggested themselves to Leonardo on the basis of a definition of beauty as a "proportionality" that must be apprehended in a single configuration (derived from Alhazen, Vitruvius, or Galen; see CNs 13, 21, and 32). When Leonardo treated "harmonic proportionality" as an essential, constituting factor that makes painting the supreme mode of artistic imitation, he also approached medieval literary sources that associate all ornament with the harmonious proportion that unites form and matter. Sound and pictorial effects

were considered sensual ornaments of allegory, proportional to the truth enclosed in an image directed to the imagination, by medieval writers indebted to the neoplatonic metaphysics of writers like Plotinus, who defined beauty as intelligible: more than symmetry, beauty is a joy felt by the soul in the perception of that which is akin to the soul (Plotinus, *Enneads* I.6, "On the beautiful").

CN 30

The word "equiparare" that appears in the opening sentence of this chapter, like the related verb "paragonare" meaning simply to compare two relative qualities, occurs commonly in Renaissance writings. Leonardo appropriated the noun form from "equiparantia" to coin the "scientia de equiparantia" or transformation of curved surfaces (*Madrid Codex II*, fols. 111-112, c. 1503-1505) in his mathematical studies which can be related to his comparisons of the arts because in both cases the rule of proportionality is a fundamental feature (on the "Rule of Three," see CN 2). Leonardo used the word "paragonare," meaning to "judge degrees of experience," while "equiparanza" suggests a level of scientific generality (i.e., knowledge of causes). "Equiparantia" refers to the universality of scientific knowledge, as opposed to mechanical knowledge. Leonardo described "equiparanza" as "the mode of infinite process" (CA 45v, with reference to rules for squaring a circle; compare "paragonare" on *Ms. A*, fol. 107v; and *Libro A*, Carta 50.100). For many years he planned a book on the subject in imitation of Alberti's "ludi geometrici" (Marinoni, 1960; McCabe). The subject still appears in his final endeavors as a treatise on scientific methods for squaring curved figures (CA 45 r-a, c. 1515-1516; see McCabe, 121, 118). Leonardo's early notes in *Ms. A* are in fact based on Alberti's *De lunulareum quadratura* (Marinoni, 199; McCabe, 110). Later, around 1508, Leonardo translated a commentary on Archimedes from Latin (on Leonardo's knowledge of ancient studies of the transformation of curved surfaces, by Heron, Philoponus and others through Giorgio Valla's encyclopedia, see Clagett, 1978, 501, 519 ff.; with reference to Pacioli's scientific games, see Pedretti, 1957).

In Chapter 30, the argument proceeds from final cause: the nobility of music and painting is judged according to their relative permanence or eternity. A key argument made elsewhere but absent here is that the proportionality of painting is perceived instantaneously (compare Chapters 29 and 31). The most important argument in Chapter 30 concerns the basis for evaluating

beauty in music. Leonardo's polemic turns on the issue of artistic invention, and it seems that he combined two considerations, the nobility of a subject and the cause of variety in music, to devise a rhetorical defense consistent with his definition of painting as a mathematical science. He argues that in the power of invention, compared in universal terms (*equiparata*), the painter is superior to the poet because, while both achieve the same varied beauty of harmony that leads the soul to grace, the painter's work is the more perfect imitation and the more noble subject because his artifice is more eternal than that which is created by nature. Leonardo defined geometric proportionality on harmonic principles that seem to be fundamentally indebted to the notion of musical except that he does not consider harmony to be merely an embellishment that lends *varietà*, but the essential scientific foundation of his art, as did Alberti (*De re aedificatoria*) and other artists whose ideas derived from Vitruvius (see Kemp, 1990). In the present passage he contends in more conventional terms that that which is more eternal is of greater nobility, but Chapter 32 presents the further implications (compare also the arguments against sculpture, Chapter 36 ff.).

CN 31

This chapter is a pastiche compiled from at least three sources. The first paragraph is extant in *Ms. A*, fol. 103r, ca. 1492. The second source probably ends after the eighth paragraph, where the scribe writes: "you are missing something . . ." (see Reader's Notes). The following, final paragraph is probably a later formulation: references to continuous and discontinuous quantities do not appear in Leonardo's notes until c. 1498–1503 (see Chapter Three). The reference in Chapter 31 recalls the definitions of perspective in *Madrid Codex II*, ca. 1503–1505, while the language and ideas of the rest of the chapter, which are similar to passages in *Ms. A*, suggest a date around 1492. Nearly all the arguments against music in Chapter 31 (with the exception of the excerpt actually from *Ms. A*, which is about music) were formulated in *Ms. A* as polemical comparisons of painting to poetry and to sculpture (Chapters 19 and 38).

Chapter 31 provides additional evidence that the sixteenth-century editor played an active role in ordering and producing Leonardo's polemical comparisons of the arts. Apparently, the editor composed this argument out of fragments, and also pressed into service as an invective against music the expository discussion

he excerpted from *Ms. A*. Addressing the issue of authenticity, Pedretti (1964, 129) states that the compilation of different manuscript sources “strengthens the impression that Melzi arbitrarily arranged notes of different periods,” but he adds that Leonardo himself might have compiled such an anthology “in his late period.” However, the sequence of Chapter 31 argues against Leonardo’s participation in the present arrangement, which, in microcosmic fashion, mirrors the topical, humanistic organization of the whole *Parte Prima* (see further CN 33; and the Reader’s Notes).

In *Ms. A* Leonardo discussed music with reference to proportion and the powers of the *imaginativa* or *ingegno*. His best known passage on this topic compares the sounds of bells and stains on walls in their ability to stimulate the artist to new inventions (*Ms. A*, fol. 102v; included in the *Codex Urbinas*, fol. 35 [ed. McMahon, n. 76]; see Gombrich, 1961). The relationship of music to both *ingegno* and *scienza* is clarified by another passage from this section of the original manuscript, the second paragraph on *Ms. A*, fol. 105v, where the main issue concerns the right relation of theory to practice, which is discussed in similar terms in the sixth paragraph of Chapter 31. Leonardo writes that the painter is not praiseworthy if he is not universal, following Alberti (*On Painting* 3.60), who, although he does not use the term “universal,” also praises painting that appeals to a universal audience by depicting nature. Alberti values *copia* and *varietà* “as far as *ingegno* allows,” by which he means diligent practice of nature’s gifts subordinate to the demands of decorum (*On Painting*. 3.60–61; compare *Ms. A*, fols. 104v, 106r, 108r). However, by “universality” Leonardo also means that the painter should ornament his works on the theoretical foundation of geometry (compare *Ms. A*, fol. 106r). Alberti defines *ingegno* in these terms in a number of other places in the same treatise (compare Books 1.24, 2.52–53).

The subject of universality recurs in Leonardo’s later writings with increased critical independence from Alberti, for example, in *Ms. G*, fol. 5v, ca. 1510–1515, where he writes that the “universal painter” should be able to depict a variety of figures, but not with “universal proportions,” on which “I will persuade the painter not to make a rule.” In *Ms. A*, fol. 103r, in the passage immediately preceding the one excerpted in Chapter 31, Leonardo discussed the use of visual lines to measure the diminution of things at varying distances [from the viewer] by establishing proportional ratios, “grado in grado.” The “rule of 20 braccia” in Chapter 31 refers to the ratios between the things placed at varying, numbered intervals described in the preceding discussion of linear perspective in the

original manuscript. In this analogy to music Leonardo equated harmonic proportion with the geometric proportions that are used in pictorial perspective; his meaning is clarified in a third passage juxtaposed between these two in *Ms. A* where he prescribes the same rule of “comparazione” to place figures in the “storia.” The final passage on the same page of that manuscript implies that the same kind of proportionality is manifest when darkness or brightness of “accidental” shadows is compared (*paragona*). Alberti is again Leonardo’s source (compare *On Painting* 1.18).

Despite these close correspondences between Leonardo and Alberti, Alberti does not mention music in the *della Pittura*. Leonardo’s analogies derive from a variety of precedent discussions of *commensuratio*, a term used by Piero della Francesca in the *Prospettiva pingendi* and ultimately indebted to Boethius. Even if he did not know Piero’s writings as early as 1492, when he composed *Ms. A*, Leonardo was familiar with the same textual tradition through *abbachi* or handbooks of practical geometry. Vasari, in fact, praised Leonardo’s youthful studies in the *abbaco*, which progressed so fast that he confounded his master with the difficulty of his questions (*Vite*, 4: 18). In *Madrid Codex II* Leonardo worked out problems of light and shade based on exercises in solid geometry similar to those found in *abbachi* (Leonardo owned at least six around 1504, see Maccagni, 16; Reti, 1974 3: 97, n. 34). Some handbooks developed mercantile exercises into abstract proportional formulas that must have provided useful tools for artists and architects (Goldthwaite, 1981). A problem in continuous proportion identical to Leonardo’s discussions of perspective and music is known from one manuscript (Davis, 14, cites the unpublished *Abbacco 359* in the Laurentian Library, Florence; on the tradition see also Piochi; van Egmond; Baxandall, 1973, 94–101). The painter Jacopo de’ Barbari, probably one of Pacioli’s students, around 1500–1502 wrote a letter to Frederick the Wise of Saxony which makes similar connections between perspective and music. Citing the “study of visual rays” in Aristotle’s *De anima* [sic], Jacopo insisted that the painter must know the “commensurac[i]one de proportione,” or perfect number, just as the architect must know music, which determines which places have “good resonances for compositions” (*Scritti* 1: 66–70; see Chapter Two).

CN 32

This passage is the most extensive version of Leonardo’s argument for the supremacy of painting over music and can probably be dated later than the others compiled in the *Parte Prima* (see CN 29).

Comparisons to poetry using the same arguments about harmony can be dated during the Sforza period; Pedretti (1964, 178) suggests that Chapter 32 is from that period. On W19071 (*Quad. Anat.* II, folio 1r), 1513, among the latest of all his anatomies, Leonardo still compared painting to poetry in terms similar to those used in Chapter 32, exclaiming that words will never describe “with like perfection” the knowledge of “true forms” conveyed by the whole configuration of his *disegno*. There is also a related late comparison of the arts not included in the *Codex Urbino*: a paragraph on W19101 (*Quad. Anat.* III, folio 7r; R. 658), ca. 1510–1512, that repeats the comparison between words and images given in Chapter 32, concluding that the painter satisfies the eye “in harmony with the eye, as music does to the ear instantaneously.”

Like the preceding arguments in the *Parte Prima*, the present one bases the supremacy of painting on its ability to compose a “harmonic proportionality” that allows the viewer to contemplate an image in its entirety over a period of time, whereas music, like poetry, is an ephemeral experience for the audience that, therefore, does not result in such a “divine proportionality.” Unlike the other arguments, however, this one also claims that “harmonic proportionality” is achieved only when the whole and its parts can be apprehended simultaneously; therefore, painting establishes the same mathematical harmony as nature, demonstrates the causes of nature, and conveys truth by means of the scenes it represents with the certainty of mathematics. The medieval notion that the creative act of God is analogous to the *ingegno* and skill of the artist who imitates the appearances of nature with *scienza*, already voiced in connection with painting by Cennini around 1390, was repeated in this Renaissance form by many later writers on art, whose scientific ideas were transmitted in various ways ranging from workshop practices to medical and optical texts (Cahn; Schultz; Baxandall, 1972).

Leonardo’s often-repeated statement that “nature does nothing in vain” is an Aristotelian idea that probably derives more immediately from Galen’s concern with nature as a demiurge, a “Creator” to be praised with “sacred discourse” (on Galen, see May, Introduction to *De usu partium*, 10). Galen’s teleological conception of the human body as a whole in which each and every individual part is perfectly tailored to the actions it performs, was available to every artist who turned to the textual tradition of anatomy. The belief that the body reveals the passions of the soul, central to Leonardo’s considerations of painting, derives from Galen’s interpretation of the Hippocratic theory that the temperament is a qualitative

mixture of the four humors (Alberti's *della Pittura* is indebted to the same theory and would have reinforced Leonardo's interest; on Galen's debt to Aristotle's "qualities," see Temkin, 103).

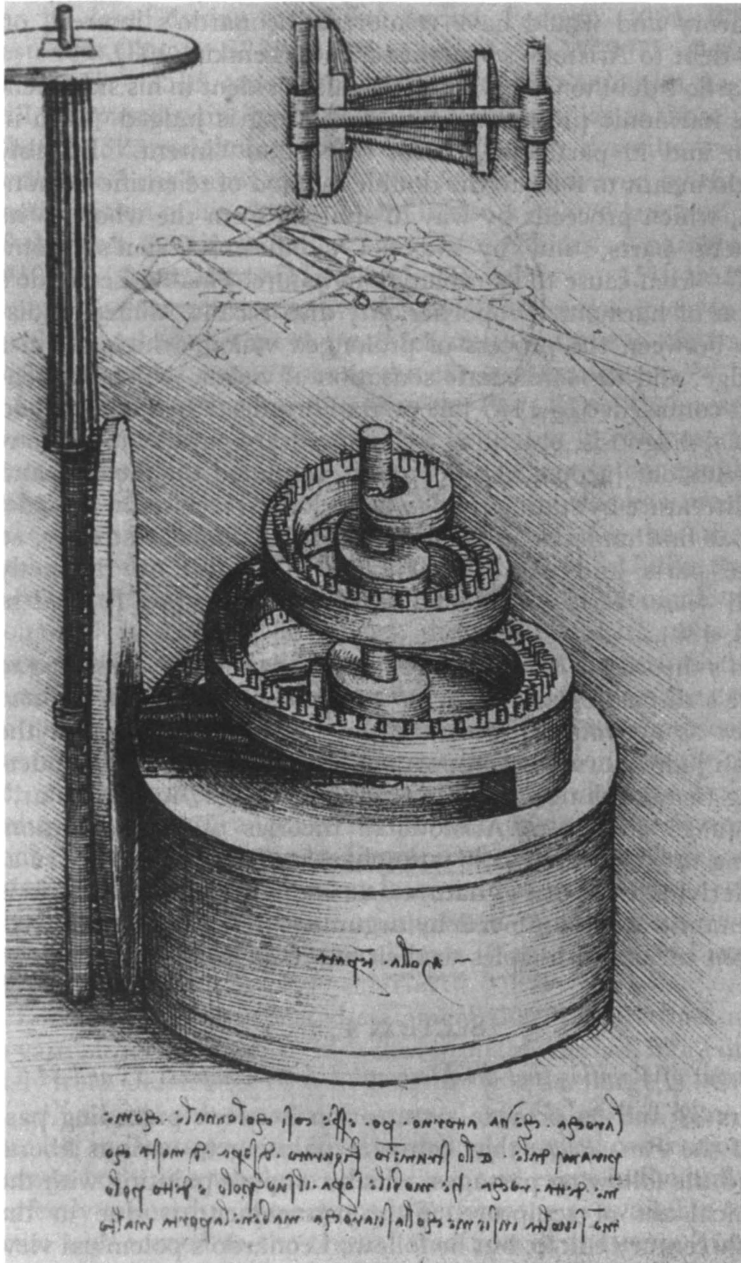
Leonardo's debt to Galen is perhaps also evident in his statement that the harmonic proportionality of painting is judged "both in common and in particular," with respect to "intent." Possibly Leonardo meant to refer to the double method of scientific demonstration, which proceeds by way of analysis from the whole to its component parts, and by way of synthesis—Galen's "compositiva"—from cause to its evolution in nature. Finally, Leonardo's definition of harmonic proportionality also recalls Alhazen's distinction between the process of prolonged vision, which certifies knowledge, and the immediate sensation of vision, which is "general and confused." In 1475 Jacopo da Forti described the method of medical diagnosis, providing a contemporary parallel to Leonardo's discussion. Jacopo, like Leonardo, conflated the medical and optical literature by stating that "when a logical resolution is made, a thing at first understood confusedly is understood distinctly, so that the parts and causes touching its essence are distinctly grasped" (*super Tegni Galeni*, Padua, 1475, comm. text 1, cited in Randall, 188).

Galen's theories of demonstration are fundamentally indebted to Aristotle's discussion of design or composition in the *De partibus animalium* as a twofold process. When Leonardo insists that the mind can judge harmonic proportionality only by sight, by understanding (*intento*) things "in common" and things "in particular," his language alludes to Aristotelian theories of demonstration, according to which the whole is resolved into its parts to arrive at the underlying integrity of nature—an inductive process which is then demonstrated or proved by argument in the opposite direction, from causing principles to their effects in nature.

SECTION 4

Comparisons of Painting and the Mechanical Arts, Chapters 33 and 34

Chapters 33 and 34 provide a transition between preceding passages of the *Parte Prima* that compare painting to various liberal arts, and the following passages, which compare painting with the mechanical art of sculpture. This arrangement is due to the sixteenth-century editor, but he follows Leonardo's polemical view of sculpture as a mechanical art. The subject of these two transitional chapters is closely related to comparisons of human works with the works of nature that appear in Leonardo's polemics



Ill. 23. Leonardo da Vinci. Volute gear for a barrel spring. *Madrid Codex I*, folio 45 recto. c. 1498–1500. Pen and ink. Madrid, Biblioteca Nacional.

against poetry (Chapters 7, 8, and 19), while the focus of the chapters on the nature of scientific procedure is in line with the discussion in the preceding Chapter 32. Chapter 33 is also directly related to the definition in Chapter 1 that true knowledge is born from experience, and may even be considered a preliminary draft for that passage.

In Chapter 34 Leonardo argues that the nobility of any subject resides within itself rather than in human praise. He compares the works of nature with the products of art according to the purpose, or final cause, for which they are made. Aristotle, the ultimate source of a long tradition for this appreciation of artistic skill, compared things formed by nature with artificial products on the grounds that both nature and the artificer follow a reasoned course of action to its ends (*Physics* 199a10). Following this Aristotelian tradition that associates the products of art with the works of nature, Leonardo argues that the knowledge imparted by science, and the manner in which art participates in the order of nature, are related. Leonardo follows Hugh of St. Victor's basically Aristotelian scheme of the theoretical, practical, and productive (or "mechanical") sciences (on medieval classifications, see Ovitt). Hugh identified the first science with God, who creates nature; the second science with the works that nature brings forth; and the mechanical sciences with human artifice, "which . . . borrows its form from nature" (*Didascalicon*, 1.20).

Hugh's discussion can be referred to the *De partibus animalium*, where Aristotle defined a systematic course of investigation in the natural sciences. Aristotle described this procedure as a continuous series of divisions into *differentiae* characteristic of the essence of a species (643b34), and he praised the beauty of this form, noting that even the most ignoble animals disclose the "artistic spirit that designed them" to intellectual perception, which causes immense pleasure for those who can trace the links of causation (645a). This discussion was repeated by Galen, who added a hierarchical contrast between the macrocosm of the universe and the "trivial and disorganized things here on earth" (*De usu partium*, Book 3, l. 175–177; see also the Introduction to the Commentary Notes on music). Galen also emphasized Aristotle's comparison between natural and human artifice when he praised the role of the artist, Aristotle's "efficient cause." Galen specified that the "work of Phidias" should be judged apart from the value of the material in which he works "for the uncultivated man sees beauty in material whereas it is the art itself that seems beautiful to the artist." In Chapter 34, the terms are too general to suggest that Leonardo had

Galen's discussion specifically in mind, but here and even more so in later chapters of the *Parte Prima*, Galen's praise of the artist's powers of invention, argued from final cause, can be distinctly sensed. The basis for this claim, also set forth by Aristotle, is that the universe is organized according to a hierarchy. Galen considered that even the lowest position in this hierarchy is "so beautifully ordered that it could not possibly be improved" (*De usu partium*, 177). Leonardo's reference to the nobility of "grasses, stones, and trees," in Chapter 34, brings to mind Galen's discussion, which was repeated in the sixteenth century by Vincenzo Danti, who praised the "pure intentional form of nature" (on Danti, see Summers, 1981, 518).

Leonardo's defense of the science of painting may depend directly on his study of anatomy in other respects as well. The majority of Leonardo's discussions for ordering the study of anatomy date from the period 1506 to 1513 (see R. 796–815). Among these passages are discussions of anatomy which indicate that Leonardo was especially interested in adapting Galen's method of demonstration to his own graphic presentation of anatomy (Kemp, 1977). In Milan, Leonardo could have had access to the foremost authorities on Galen, and it is difficult to imagine that his intense study of anatomy during periods beginning with his stay at the Sforza court, and continuing until ca. 1515 in Rome, were not informed by the most current sources available (see Kemp, 1981, 285, for an assessment of Leonardo's association with the anatomist Marcantonio della Torre). Leonardo's knowledge of Galen's theory of demonstration is documented much earlier, however, by a letter drafted before August 1490, on CA 270 r–c (see Chapter Two). In an earlier idea for this letter, jotted on a page of architectural drawings (*Codex Trivulziano*, fol. 4 recto), Leonardo defended his capabilities as a "doctor architect" who can repair the "maleto domo." Galen had compared medicine to architecture in precisely the same terms, by saying that the healing technician is really more like the repairer of houses (Galen, *Microtegni*, Chapters 1 and 10, cited in Gilbert, 1960).

If Leonardo's commonplace analogy between architect and doctor (and related evidence) can indeed be referred to Galen, then, as early as 1490, Leonardo knew Galen's discussion of method at the beginning of the *Ars parva*, where the theoretical, practical, and productive "genus" of the arts are distinguished. In language strongly recalled by Leonardo's claims in Chapter 33 and the "Proemio series," ca. 1490, Galen presented the science of medicine as a discipline founded on reason and experience (see Chapter

Three). Galen emphasized that we use names in our discourses “for the sake of showing the beliefs concerning the soul which we acquired from examining the nature of things.” He added that it is ridiculous to abandon these criteria in favor of a contention about words, since the “instruments” that provide standards for the products of the arts are not words but “untutored confidence” (Gilbert, 1960, 21–22, citing *De placitis hippocratis et platonis*). Defining art as that which communicates to all with reasoned experience (*experientia ratione*), Galen then defined medicine as a productive art intermediately numbered between arts like music that do not result in any work from their operations, and arts that do, such as “statuaris, pictura, et fabrilis” (*Introductio seu medicus*, Cap. 1–2, ed. 1550, folio 50 verso ff.; compare Aristotle, *Nicomachean Ethics* 1130a10–13, distinguishing art from science and practical wisdom because it results in a product).

In the Middle Ages, the Aristotelian distinction between the theoretical, practical, and productive sciences was transmitted through the medical tradition of Galen in the commentaries of Avicenna (Ottosson). The importance of Galen to Quattrocento classifications of the sciences, by Poliziano, Giorgio Valla, and others, has been noted (Monfasani). Giorgio Valla’s encyclopedia, which included seven treatises by Galen and two commentaries, can begin to suggest his currency at the end of the Quattrocento. From the evidence available, we know that many of the issues discussed by Leonardo were also raised by his contemporaries, like Giorgio Valla who defined art as that which proceeds “with imaginatione ideo cum inaginatione propter naturam . . . de vario cognitionis modo”—that is, from imagination of the idea to artifice according to various modes of cognition proper to nature (*De expetendis et fugiendis rebus*, 1501, cap. 3).

Fifteenth-century controversies over method may have been fueled by disputes associated with the Council of Florence held in 1439. The visiting Byzantine scholar Georgias Plethon, at the center of heated polemics that went on for many years, defined theological issues in terms of the difference between mechanical art and artifice based on deliberation (for an overview of this history, see Monfasani; Woodhouse, with a translation of Plethon’s text). Plethon’s neoplatonic argument for “ideal forms” presented a distorted view of his source in Aristotle, however, since he did not mention Aristotle’s crucial distinction between the “necessity” of science and the “hypothetical necessity” of art (*Physics* 200a ff.); but these historical controversies still await study.

Certainly Galen was extremely important to sixteenth-century discussions of the “arts.” Benedetto Varchi explicitly cited Galen’s three *tegni* (arts) when he defined painting as a “factive habit” distinct from science because it results in a product (“Prima disputa,” *Due lezioni*, 1546, reprinted in *Scritti* 1: 6 ff.). Varchi distinguished between the immutable cognition of science and the artifice of art, and, like his predecessor Valla, he created a corresponding distinction between definition and description, identified with the particular and the universal, the accidental and the essential, respectively. Varchi’s argument, which turns on these sets of distinctions, includes a contrast between *ingegno* and physical labor (*fatica*) identical to Leonardo’s. Distinguishing between *ratio* and *experientia*, the “two legs” (as Varchi calls them) of Galen’s theory of demonstration, Varchi also argued, in terms that again recall Leonardo, that art has more power than experience because art knows causes, by two modes: the proper and the common—that is, by invention or experience, and by doctrine (compare Chapter 32). Similar arguments indebted to Galen were developed by Daniele Barbaro in his commentary on Vitruvius, and by others (see Chapter Four).

Although Leonardo did not distinguish between the operative and productive sciences in such a systematic fashion, he made many similar claims defending painting as a science distinct from the mechanical arts. Like Varchi, Leonardo associated the key element “definition” with *disegno*. The underlying distinction between experience and doctrine was fundamental to Galen’s complementary methods of analysis and synthesis, and the mode of definition that results from them. Galen’s insistence that arguments begin by defining terms derives from Aristotle, *Topics* (103b ff.), where Aristotle delineates “predicates” according to ten categories that combine with subjects to form the propositions from which reasoned arguments begin (see Chapter Two and the introduction to the Commentary Notes on poetry, on Leonardo’s debt to Aristotle’s predicates, via optical theory). Such fundamental resemblances between Leonardo’s polemics and later, sixteenth-century discussions on the status of painting and sculpture can be explained by the circumstance that humanists and artists shared the same textual sources.

CN 33

The argument in Chapter 33 is rhetorical, rather than demonstrative, closely related to the early polemics known as the "Proemio Series" (R. 9–13, 21, especially R. 12 and 21), a literary type that seems in Leonardo's writings to derive from the medical tradition of Galen rather than optics. For example, Leonardo states on CA 119 v–a, ca. 1490 (R. 21), that since the soul and life cannot be proved while things that can be known and proved by experience have been ignored, he will discuss the functions of the eye based on experience rather than on the definitions of previous authors. The polemics against orators in these passages also suggest a source in Galen (see Chapter Two).

This evidence also suggests that Chapter 33 records a period in Leonardo's writings when he depended on anatomical sources for his definitions of painting. Yet there are also other indications that the passage dates from a later period. Leonardo's reference to "discontinuous and continuous" quantities suggests a date after he had discarded Galen's model as the basis for his definition of painting around 1498 (see CN 9). On the other hand, Leonardo might have returned to this polemical type of argument at a later date, around 1507 or later, when he studied anatomy intensively (Kemp, 1981, 285 ff., argues that, beginning in 1510, Leonardo avidly studied Galen's *De usu partium*). This hypothesis is corroborated by two folios on anatomy which were begun ca. 1489 and continued ca. 1506–1508 (R. 797 [W19037, *Anat. B* 20v]; R. 357, 375, and 1178 [W19038 r–v, *Anat. B* folio 21r–v]). R. 797 is a programmatic outline for a treatise on anatomy that follows the method of Galen in describing general principles and then analyzing the particular parts which make up the whole. The other, related folio includes an invective similar to the early "Proemio series" (R. 1178). Many of Leonardo's plans for ordering the study of anatomy date from the period beginning 1506 until 1513 (R. 796 to R. 815). On *Anat. Ms. CI*, fol. 2r (R. 798, W19061), he outlined a treatment of anatomy in twelve figures represented from three points of view that will present the "cosmography of the lesser world" on the same plan as Ptolemy. There are discussions related to this passage in which Leonardo contrasts the prolixity of writing to the conciseness of stereometric drawings that represent a figure from different points of view (W19013 [*Anat. Ms. A*, fol. 14v]; W19007v, [*Anat. Ms. A*, folio 8v]; see CN 32 for comparisons of the arts related to these plans; Leonardo owned Ptolemy's *Cosmographia* by 1505: Reti, 1974, 3: n. 88; on the similarity between Ptolemy and Galen, see N. Gilbert, 1960, 23).

It is not surprising that Leonardo's discussion of painting as a science based on sense experience stems from both the medical and optical traditions. Galen's Aristotelian theory of demonstration, with its insistence of the linear method of geometric demonstration, is easily reconcilable with the science of optics defined as a *scientia media*. In Chapter 33 Leonardo used Aristotle's ten categories, which he probably derived from optical theory, to define the "scientific and true principles" of painting (the list recurs in other, recognizable permutations, notably on CA 250 r-a, CA 90 r-b, *Ms. A*, fol. 103v, all datable ca. 1490–1492). In Chapter 36 of the *Parte Prima*, Leonardo's definition of the same properties of "light, darkness, color, body, figures, position," and so forth as "discourses," calls to mind his humanist counterparts who redefined the medieval productive or mechanical arts as rational sciences that follow the principles of demonstration set out by Galen (Monfasani). Galen's discussion of definition in the *Method of Healing* might have been a major catalyst for Leonardo's argument in the present chapter:

... it has been shown that the beginnings of all demonstration are the appearances which are clear both to sense perception and to the intelligence; and in the case of all things inquired into, one must take [careful] consideration of the names . . . And in this you see all of them untrained, so to speak, not only the physicians of our day, but most of the philosophers as well. For few of them know how to distinguish the differences in words from those in subject matter . . . What then is this method? To begin with the differences in things, not those in names . . . And then, according to each separate name established for things, to pursue the subsequent discussion without changing the meaning of one word in any way, but accurately preserving it as you yourself have fixed at the beginning of the subject (*Liber Megategni*, Book 5, translation cited from N. Gilbert, 1960, 20).

CN. 34

This comparison of painting and writing, like the preceding passage, defends painting as a science. The main argument in the present passage is that the nobility of any subject resides within itself rather than in human praise. Leonardo writes that "painters have not described their art and reduced (*ridotto*) it to science," a statement that can be interpreted to mean that, even though the principles of painting have not been explained in words, its nobility resides in its ends, that is, the visual product. The contrast is between two shadings of the word "scienza," referring both to theoretical principles and, at the beginning of the passage, to the "science of painting," founded on optics and demonstrated visu-

ally. On the basis of the association of the products of art with the works of nature, Leonardo argues that the knowledge imparted by science concerns the manner in which art participates in the order of nature: painting is made noble “not unlike the way that works of nature are made.” The theme of the nobility of nature was developed by many writers, from Cicero and Vitruvius to Augustine, who praised the commensurability of the parts to the whole in terms similar to Leonardo’s appreciation for “divine proportionality” (compare Chapters 29–32).

Another key to Leonardo’s discussion lies in the generalized nature of his reference to “writers,” an allusion to the arts of discourse, e.g., dialectical reasoning. According to Aristotle, inductive arguments proceed by discovering the differences and likenesses among things by classifying the subject or topic under discussion according to elements arranged in a hierarchy (*Topics* 103b). Boethius, in *De topicis*, and other writers, developed Aristotle’s techniques of dialectical disputation into a systematic hierarchy of *genera* and subordinate species (see CN 26). Aristotle applied the same logical method in *De partibus animalium* to establish a systematic course of investigation in the natural sciences. He set out a continuous series of successive *differentiae* whose division has intended to show what combinations of characteristics express the essence of a species (643b34). This same discussion was repeated by Galen, a likely source of Leonardo’s information (*De usu partium*, Book 3, 1.175–177).

Leonardo’s own argument proceeds according to a basically Boethian scheme: he judges science, divided into the opposed categories, or *genuses*, of writing and painting, from final cause. Within this argument, in line with definitions of the nobility of the productive sciences or arts according to its aim, Leonardo claims that nobility resides in the subject rather than its mode of communication. He then introduces a higher genus of “subject” than human science—namely the works of nature. According to the *differentia* “knowledge,” he identifies the opposed *genuses* (or species) of “human” and “nature.” Since the higher genus of knowledge is “nature,” he argues that knowledge without language is more noble than knowledge dependent upon human language. The implication, cleverly suggested but not stated, is that painting, which also lacks human language, is therefore more noble than letters. Had Leonardo stated this conclusion outright, however, it would have been invalid because only nature—not all knowledge without language—had been admitted into the argument as being more noble.



III. 24. Leonardo da Vinci. Study of Michelangelo's *David*. c. 1504. Pen and ink. Windsor, Royal Library W12591 recto.

SECTION 5

Comparisons of Painting and Sculpture, Chapters 35–45; and Chapter 46 on Poetry

Only one passage on sculpture included in the *Parte Prima*, Chapter 38, is extant in Leonardo's original manuscripts. Four others (Chapters 41, the final paragraph of 43, 44, and 45) were incorporated from the lost *Libro A*, which, according to Pedretti's reconstruction, can be dated ca. 1508–1510 (see the Introduction to the *Parte Prima* texts; on problems of dating, see CNs 38 and 41). The polemics from *Ms. A*, composed in the courtly environment of Milan, frequently contain literary allusions missing from the later passages from *Libro A*. This trend towards simplification is particularly noticeable in the early and later versions of the argument that sculpture would be one color without the aid of incidental light (compare Chapters 38 and 45). Correspondences between *Libro A* and *Ms. A* are so extensive, in fact, that Pedretti and Brizio have suggested that Leonardo copied (and revised) earlier passages into the later notebook, which must have been his most extensive compilation on painting.

There is no extensive literary tradition for comparisons of painting and sculpture comparable to the tradition of *ut pictura poesis*. The textual sources for Leonardo's defense against sculpture derive from his own arguments, grounded in longstanding issues, about imitation in poetry and music. Leonardo transformed these precedents to argue that the truest and most admirable imitation of nature imitates nature's appearances, and this requires the most artifice. In particular, painting is superior because it creates illusions of depth and motion. He argues that sculpture is inferior to painting because sculpture is a "natural body." On the other hand, he maintains that painting is superior to poetry because painting is a "work of nature." The apparent contradiction presented by these two arguments is resolved by turning to their common foundation in Leonardo's claim that the nobility of art should be judged according to the excellence of the maker's artifice (see CN 41). In the case of sculpture, the "glory" of art belongs to nature, whose light and shadow create relief, while in the case of painting, the painter himself, by means of artificial perspective, creates a similitude of the same effect on a flat surface.

Sometimes it is possible to glimpse concrete relationships between Leonardo's arguments on painting and sculpture and his artistic practices, but the presence of narrative conventions, topoi, and other literary formulas make it difficult to identify the courtly

persona of the painter in the *Parte Prima* arguments with the practicing artist, Leonardo. One obvious cautionary note is the fact that Leonardo never defended his professional expertise in any medium except painting—and least of all in sculpture—despite his deep involvement with the colossal equestrian monument of Francesco Sforza during the period when the polemics in *Ms. A*, and perhaps others known only from the *Parte Prima*, were recorded. Yet these same literary descriptions also indicate that Leonardo, who thought of sculpture more as a process of modeling than as direct carving, incorporated experiences about his sculptural procedures that lie at the foundation of his conception of painting. According to Martin Kemp (1988), who has studied Leonardo's empirical investigations of plastic form in light of his recurrent argument concerning the value of multiple view figures, Leonardo's understanding of geometry as the investigation of continuous quantities clarifies these otherwise obscure connections among his interests in pictorial perspective, motion, and sculpture in the round (see further CNs 1 and 9). Leonardo's interest in the geometry of transformations is the theoretical complement to his inventions such as new casting techniques and graphic methods for recording three-dimensional figures in two dimensions.

Still, Leonardo's arguments defending painting against sculpture were probably originally intended as elegant sophistry to amuse an educated audience; and therefore, even when the discussions seem to be straightforward descriptions of artistic procedures, his comparisons of painting and sculpture may have other dimensions. In his drawings and literary descriptions of nature, Leonardo may have intended to present his audience with variations on medieval metaphysical allegories, again as Kemp (1985) has suggested (see Chapter Two). Leonardo's descriptions of artistic procedures also share significant traits with medieval allegories. For example, when Leonardo openly imitates the ancient allegory of Lucian's "Dream" (Chapter 37), his description also recalls Alain de Lille's description of "Arithmetic" in the twelfth-century allegory *Anticlaudianus*. Alain's "Arithmetic" uses "the labor of her mind and of the artificer" to construct a wheel, so that "the pointed stone sinks to a level surface, the valley rises to a level, the angle is lowered to a curve, the found surface is flattened, the plane reduced to a wheel . . ." (*Anticlaudianus*, 3.4). Leonardo's similar description of the sculptor's menial operations suggests not a direct relationship between these two texts, but rather that some of Leonardo's arguments may indeed be ironic or paradoxical (see discussion of "iconic descriptions" in Chapter Two).

Some arguments, notably Chapter 37, may parody humanist claims for eloquence as the art of persuasion, and it is even conceivable that Leonardo's discussions are indebted to the use of paradoxical language in the natural sciences (compare the scientific precedents discussed by Durand, Clagett, 1967). A prime example of an argument with paradoxical implications is Leonardo's praise of the painter's ability to imitate atmosphere and landscape on "one flat surface," causing the contemplator to admire how the painter is able to deceive him. This argument is based on an ancient topos defending figured language against the charge of sophistry (see further, CN 35). Whether or not Leonardo employed irony to ridicule humanist discourses, the transformation of artistic issues from a literary to a visual context is implicit in his mock-invectives. Writers like Alberti and Lorenzo Valla had claimed that difficult philosophical content should be presented in lucid, elegant, figurative language aimed at a universal audience, as Cicero prescribed. Cicero criticized sophistic ornament that "wanders from subject to subject in far-fetched metaphors arranged like combinations of painted colors to delight the eye," in contrast with true decorum between thought and language (*Orator* 19.65–69; based on Aristotle, *Poetics* 1447a). Many quattrocento humanists also followed Ciceronian ideals in praising the utility of rhetorical disputation to present differing views on the same issue to arrive at the truth (compare Valla, *De vero falsoque bonum*, 13), and the practice of arguing all sides of a question, *in utramque partem disserere*, was a popular technique to balance arguments in literary dialogues (see Marsh).

Leonardo's frequent criticism of superficial ornament, which follows in this tradition, may have an immediate precedent in Alberti's treatise on painting, long recognized as the most important source of his statements on figurative decorum. It has been suggested that, following the precedent set by George of Trebizond's polemic against Guarino of Verona's "absurda composita," Alberti's treatise on painting censures certain humanist literary practices. According to Baxandall (1971), when Alberti wrote about painting, he also intended to reform literary criticism along the classicizing lines of Cicero's middle style. A parallel to Alberti exactly contemporary with Leonardo is Pomponius Gauricus' *De sculptura* (Florence, 1504) which, though not tendentious like Alberti, is similar to him in equating the artificial constructions of prose and visual images. Pomponius formulated a theory of visual decorum that awkwardly conflated pictorial *perspectiva* with literary *perspicuitas* (N. Gilbert, 1960, 12, discusses historical precedents).

However clumsy this idea sounds to modern readers, the scheme must have filled a great need for a humanistic theory of pictorial composition suited to practicing artists, judging from the frequent reprintings of *De sculptura* throughout the sixteenth century (see Chastel and Klein, Introduction to *De sculptura*).

Without doubt these circumstances add a note of indeterminacy to Leonardo's concrete discussions of painting and sculpture, but they also call attention to the originality of his synthesis. In his later comparisons of the arts in *Libro A*, and related writings in *Mss. E* and *G*, and elsewhere, Leonardo demonstrated a consistent trend toward stylistic simplification. He moved away from elaborate literary allusions and redirected his earlier discussions of pictorial decorum towards increasingly formal, stylistic considerations. His discussions of decorum in these late writings are based on his own observations, such as the combinations of reflected colors that are *belli* rather than *brutti*, and the proper placement of figures so that they do not obscure the clarity of the light and shadow depicted on optical principles (passages are cited in Appendix 1; see discussion in Chapter Three). These late writings constitute a critique of Alberti that must result from experimentation with his precepts in composing paintings, and they are devoid of Alberti's moralizing overtones.

Leonardo cast his arguments against both poetry and sculpture in Horatian terms that he probably knew best from Alberti's treatise on painting. Over the course of his career, Leonardo transformed theories of imitation that stressed moral decorum into arguments addressed exclusively to problems of formal or stylistic decorum. According to Alberti's source in Horace, it is not enough for poems to be beautiful; they must also charm the listener by eliciting the emotions of his soul (*Ars poetica*, line 98). So poets should draw their models from life, in this way causing delight through the power of the artist's *ingenium* rather than through superficial artifice, i.e., "verses void of thought" (lines 318–323). This ancient distinction between superficial and substantive artifice was developed further by Augustine (see Chapter Three).

Alberti had borrowed conventional descriptions of artistic procedures from Cicero, who had in turn described the order of making a work of art from outline to color (*Orator ad Brutum* 2.8–10) according to formulas derived from ancient technical arts treatises where critical terms such as *ratio*, *lumen*, and *umbrae* originate (Keuls, 72; Pollitt). Late passages like *Ms. G*, fol. 23 verso, illustrate the extreme abstraction of Leonardo's late views, where he synthesized

the problem of representing *disegno* with the problem of representing heightened color on optical principles (Chapter Three). These lifelong investigations constitute a revision of Quattrocento painting practices.

It seems that Leonardo referred to sculpture in his polemics solely as a means for defining the essential characteristics (or *differentia*) of painting. The main arguments might be described as a series of antithetical comparisons: physical labor (*fatica*) versus *ingegno*; science versus mechanical art; natural versus evident artifice. But the central argument is always that the artist's *ingegno* is responsible for the value of a work of art, judged in terms of the intellectual pleasure derived from contemplating artifice that both imitates nature and demonstrates nature's causing principles. This claim is indebted to medieval discussions that judged the productive or mechanical arts by the nobility of their ends (see Chapters 33 and 34 and notes *sub numero*). Leonardo's antithetical comparison of physical effort and *ingegno*, which revolves around artistic invention, has an important precedent in Filarete's discussion of the accidental qualities of architectural decoration. Ultimately Filarete's language and Leonardo's both derive from Aristotle's ten "predicates" (see CN 39; on Filarete's "qualities," see Onians, 1973).

These formulaic arguments also recall comparisons of painting and poetry in which Leonardo refers to the ornaments of nature (sometimes called *discrezioni*) as its "accidental qualities." In Chapter 38, Leonardo identifies imitated relief as the painter's "accidentale arte." The arguments here and elsewhere, for example in Chapter 42, rest on the Aristotelian definition of "accidentals" as a subject's inessential properties or "predicables," such as light and dark, which vary with circumstances. In actual relief the "accidents" of light and shadow are inessential, created by nature, but in painting they are essential, created by "art." The sculptor merely imitates the accidental contrasts of light and shadow that nature provides for him, so that the sculptor impresses in his carving nature's accidents, not those of his own invention. When the sculptor of low relief uses perspective to foreshorten forms, he "paints," because the illusion of distance created by human artifice is the painter's province. The painter's artifice, or invention, begins with "mental movements" that the *fantasia* imagines and the hand records in the "unfinished composition." Ornament, the "perfection appropriate to all its parts," is added at a later stage.

This describes a two-part process, grounded in artistic practice, that corresponds with rhetorical *inventio* and *elocutio* (see CN 25).

The connection between artistic procedures and Leonardo's discussion of invention derived from a rhetorical model is further elucidated by two passages on painting and sculpture preserved in the *Parte Seconda* of Leonardo's treatise on painting: (*Codex Urbinas*, fol. 50, ed. McMahon, n. 102, which is not actually an invective against sculpture but an encomium to *disegno*; and *Codex Urbinas*, fol. 33 verso, ed. McMahon, n. 89). In both passages, Leonardo argues that the painter surpasses the sculptor by means of foreshortenings, relief, and the actions of his figures which only the best painters can judge truly. In these discussions, he identifies *disegno* closely with invention, rather than ornament, and establishes the excellence of *rilievo* by closely identifying the movements of the painter's *fantasia* with the movements of his figures. Accordingly, the artist's *ingegno*, demonstrated in the *difficoltà* and perfection of his figures, depends on procedures of *disegno* associated with painting.

The quarrel between painting and sculpture is in large part Leonardo's own creation and that of his sixteenth-century editor who, excerpting arguments from Leonardo's writings on a variety of related topics, constructed arguments aimed at the contemporary quarrel between painting and sculpture that were filled with material derived from traditional defenses of poetry, interdisciplinary analogies based in optical, mechanical, medical, and other scientific writings, and descriptions of workshop practices. This literary record of Leonardo's diverse experience as a manipulator of plastic form would have entered mid-sixteenth century discussions about the value of the arts had the *Codex Urbinas* circulated (see Chapter One). It is, however, unlikely that any of Leonardo's arguments—except for the early ones Castiglione used in *Il libro del Cortegiano*—were directly known to Cinquecento audiences. Leonardo's interest in *rilievo* imitated in painting is rooted in artistic practices, which had, at least since Lorenzo Ghiberti, employed the textual tradition of formal optics (see Chapter Three). The scientific foundation of *disegno* can be associated with earlier Renaissance appreciations for difficult foreshortenings in pictorial relief, such as Ghiberti's praise of relief that strives to imitate objects measurable to the eye ("con ogni misura"), or Manetti's praise for Brunelleschi's innate recognition of arrangement and structure in ancient sculpture (cited in Manetti, 50–51). Again, visual precedents to Leonardo's innovative approach to drawing are found in the scientific practices of Antonio Pollaiuolo and Verrocchio, both of whom developed the use of continuous line to define contour and internal modeling simultaneously (see White, 1967, 201). Pollaiuolo also developed a new vocabulary of figure

types using stereometric methods that utilized both sculptural models and drawings to create multiple views of the same figure rotated around a central axis (Summers, 1977b; Fusco). These effects are vividly recalled by Leonardo's appreciation for the figure seen from all sides, a subject with which he also dealt at length in his studies of perspective (see Veltman).

A major issue associated with the mid-sixteenth century rivalry between painting and sculpture concerned different methods used to foreshorten figures. Cinquecento apologists countered arguments for the supremacy of painting based on perspective by asserting that sculpture is closer to nature and therefore superior. Two methods of foreshortening, one using the projection techniques of geometric perspective, and the other proceeding empirically by working directly from models or devising other methods that depend on the judgment of the eye, had been recommended as early as Alberti's treatise on painting (see Chapter One). Related to this issue is a fragmentary discussion of clay modeling attributed to Leonardo by Lomazzo (*Trattato dell'arte de la pittura*, 1584, 158–160; cited in Pedretti, 1977, 70 ff.), where Leonardo is said to have written that the ancients named clay modeling as the sister of painting, and "Sculpture" chose modeling as her mother, because it provides a "guide or pattern" close to the imagination which, afterwards, is measured with compass and transferred onto marble. In Chapter 36, a similar argument runs that the good sculptor, like the painter, has good *ingegno*, which includes knowledge of measure in that he understands the principles of foreshortening in perspective so that he is not deceived by the experience of sight alone. As early as *Ms. A*, ca. 1492, Leonardo conceived a number of exercises for improving the ability of the eye to make accurate judgments without the aid of instruments (see CN 42). The value of these exercises rests on the notion that the artist who uses himself as an "instrument" in an action is equal to the scientist or inventor who fashions an original design, while the artisan who works without this instrument, works with inadequate knowledge of the theoretical.

From Plato to Leonardo, the mechanic was distinguished from the man of theory by the former's use of external measures (see Chapter Two and the introduction to Section Four of the Commentary Notes). In ancient artistic practices, for example, artists made clay or other sculptural models that workshops of stonemasons then executed by pointing off the measurements from the original (Wace, 28 ff.). Ancient descriptions of artistic procedures became topoi of medieval metaphysics, from Plotinus' exemplification of inner beauty in terms of the sculptor who "removes and scrapes"

off a formless covering of matter (*Enneads*, 1.6.9), to hexameral literature where man's formation was likened to the process of bringing rough models to completion by removing and adding material (see Panofsky, 1968, 21 ff.; Cahn, 23 ff.; Krautheimer, 175).

Leonardo's argument that nature supplies the sculptor's material is, perhaps only indirectly, indebted to these neoplatonic precedents; it may derive ultimately from ancient comparisons of the productions of nature and art, such as Aristotle's argument that the highest ranking arts "make their material," for "the helmsman knows and prescribes what highest sort of form a helm should have . . . whereas in the products of nature the matter is there all along" (*Physics* 192a21–194b8). Leonardo rebukes the sculptor who takes away excess material without "knowledge of measure" and praises the painter who, "converted into nature," uses his *ingegno* to: discourse, . . . "to make his *fantasia* approach the effects of nature" (Chapter 39). Leonardo's views are similar to those of Cennino Cennini, who says that the painter's *fantasia* has the same power to compose imaginary figures as the poet, directed by an "animo gentile" that delights in drawing (*Il Libro dell'Arte*, cap. 2–3). In Chapter 38, Leonardo argues—in terms that also suggest Aristotle's distinction—that perspective is the material of painting.

But Leonardo's discussion of *rilievo* is probably indebted more immediately to optical writings, where painted relief was traditionally compared to actual sculpted relief (see CN 40; Chapter Three). Ultimately, these discussions are also based on Aristotle's definition of physical quality as "excess and defect," that is, whatever comes to be and passes away (*Physics* 287a22ff.). The painter who always "adds on materials" when he "searches for shadow and light, color and foreshortening," demonstrates forms in his paintings that express the "intention and invention" of his *immaginativa* or *fantasia*. The initial *disegno* comes from his imagination and is afterwards "clothed" in color and similar effects. Leonardo's comparison between sculpted relief and painting is founded on the analogy that painting is like a mirror, metaphorically the mirror of nature. The painter's *ingegno* "ought to be the similitude of a mirror which transmutes itself into the colors of things that are its objects" (*Ms. A*, fol. 82; see CNs 2, 38). The image of an object—according to Roger Bacon, whom Leonardo follows here—becomes ever more rarified as it is "multiplied" in passing through the medium of the atmosphere to the eye (*De multiplicatione specierum* 1.1.42–49; on Leonardo's knowledge of Bacon, see Strong). Bacon's distinction between internal and external images entered Leonardo's considerations as early as CA 270 r–b and c, ca. 1490, where he notes that

“things transmit the similitudes of the form together with the *spetie* of their powers (*potentie*).”

Also around 1490 Leonardo rejected the extromission theory of vision, which posited an active role for the visual power, in favor of a view consistent with Alhazen’s theory of the action of light in which the eye functions as a passive recipient organ (Ackerman, 1978). However, around 1508, in *Ms. D*, Leonardo reconsidered the active component of vision. Chapter 40 must be related to these new investigations. Leonardo credits the painter with “praising” the causes of nature’s “demonstrations” by depicting nature according to the laws of vision. The argument that the depth of shadow cast by low relief is “false” suggests further connections with workshop practices. Leonardo’s objection that the sculptor’s artifice depends on natural light occurs in various forms from c. 1492 to 1513–1514, when he wrote perhaps his final comparison of painting and sculpture on CA 277 v–a (see CN 2). The version of the argument given in Chapter 40 is particularly indicative of Leonardo’s scientific investigations of reflected shadows beginning around 1505, concerning cases where point of view causes distortion, i.e., monstrous effects in the perception of relief. According to this argument, the imagination of the painter judges the *bellezza* and *grazia* of nature and in the process “transmutes” what he sees into the *rilievo* feigned on a flat surface.

As materialistic as this argument sounds by itself, Leonardo’s explanation of the activity of inventing paintings, like its precedent in Cennini, also describes poetic invention. And Leonardo’s praise for *chiaro e scuro* as the “grandissimo discorso” of painting (Chapter 37) gives a new twist to ancient discussions of art, like Pliny’s praise of the inimitable skill of Apelles to depict the lightning bolts of Zeus and other unpaintable things. Leonardo’s attendant argument that the difficulty of working marble is due to the material, not the nobility of the artist, sounds like a retort to Dio Chrysostom’s *Twelfth Olympic Oration*, a defense of sculpture appropriated by many Renaissance artists, including Michelangelo (see further CNs 19 and 38). Even strictly mundane arguments about pictorial and sculptural procedures are textured with the otherness of their multiple sources. Leonardo incorporated metaphysical allegories, humanist defenses of eloquence, scientific theories and other schemata into his pictorial procedures, as well as his writings about these procedures, with the prospect that investigating these analogies would lead him to the underlying principle of their unity. The indeterminacy of his arguments can frustrate the modern reader precisely because the rich array of his possible sources is bewildering.

ing, but at the same time, to deny that such echoes and allusions frame his discussions compromises the explicit claim central to the arguments themselves, which is that painting is not a menial operation like the construction of a wheel but a noble pursuit rivaling the wonders of nature.

CN 35

The arguments in Chapter 35 are further elaborated in the following passage (on problems of dating, see note there). The main argument stems from the comparison of painting and poetry with respect to the “ornaments” or “accidental qualities” of nature (see CNs 7 and 8). The present discussion concerns the judgment of the viewer, whereas other comparisons of painting and sculpture are directed primarily to the judgment of the artist. The central contrast between natural and artificial artifice concludes with praise for the painter’s ability to imitate the vast spaces of actual landscapes and, therefore, compete with the verbal images invented by the poet. The “admiration of the contemplator” is aroused by the painter’s superior ability to deceive. This argument is a *topos* that is ultimately indebted to Plato’s condemnation of sophistry: Quintilian defended the orator’s right to deceive others by his art in order to persuade the judge to justice. Leonardo defends deceptive illusions only if they are grounded in truth (in this case, in an understanding of the laws of optics). The technical discussion of sculpture at the beginning of the chapter brings to mind similar explanations of the process of conceiving a work of art by early neoplatonists like Plotinus (and later writers like Federico Zuccaro), although it appears to be a concrete description of artistic procedures (see CN 36; on early neoplatonism, see Panofsky, 1968, 85–93; on Zuccaro, see Summers, 1987, 283–308; and compare Cellini’s description, cited in Chapter Four).

CN 36

The comparisons of painting and sculpting more than any others suggest current artistic practices; yet, for all their concrete detail, these discussions are based closely on literary sources. In Chapter 36, the description of sculpting alludes to neoplatonic Christian discussions of *deus artifex* and *deus pictor* from which all metaphor has been excised, since Leonardo argues that the sculptor is concerned purely with external appearances. Leonardo’s accompanying description of painting alludes to another well-known metaphor, that

“painting” is figurative language which veils truth in naturalistic allegory.

Leonardo must have also known Lucian’s “Dream,” in which “Culture” argues in very similar terms that the sculptor, no matter what his real qualities, will always be ranked as a common craftsman because he works with his hands. Like Lucian, Leonardo is willing to grant the sculptor noble qualities: he argues that the sculptor has the same “capacity” to right information (*notitia*) as the painter. But the clinching argument of his polemic, that the sculptor’s mental speculations are fewer than the “ten varied discourses” of painting, suggests that Lucian’s account is, in the final analysis, only a literary embellishment for a discussion of contemporary issues.

Leonardo’s antithetical comparison between physical effort and *ingegno* revolves around the kind of judgments exercised in producing a work of art. He contends that the sculptor is limited to physically establishing contours. The sculptor’s procedure of continually moving around the material being sculpted should be supported by knowledge of “measure,” but in this he is surpassed by the painter, whose judgments also concern light, dark, and color, and yet involve no physical expenditure.

Leonardo’s “ten discourses” of painting, which derive ultimately from Aristotle’s ten classes of “predicates” have a more immediate source in optical theory (see the introduction to the Commentary Notes on sculpture). Here Leonardo uses an argument concerning the subtractive process of sculpture and the additive processes of painting that occurs first in *Ms. A*, fol. 204v, ca. 1492, where the notion of “levare et porre” arises in a consideration of the properties of vision. In this context, adding on and taking away are complementary physical processes akin to the imagination’s immaterial process of combining and analyzing images. In the final pages of *Ms. A* Leonardo conceived a number of practical exercises for painting *rilievo* well, such as placing the boundaries of figures (*termini*) against bright fields to heighten contrast in order to improve the ability of the eye to make accurate judgments without the aid of instruments (fol. 111v; compare *Ms. C*, fol. 14v, slightly earlier, on *rilievo* in terms of contour or boundaries; CA 204 r–a, ca. 1490, treating the “profiles” of figures placed in the corner of a room in terms of perspective; *Libro A*, Carta 15.11, ca. 1508–1510; on the judgment of the outlines [*lineamenti*] of figures, see CN 45).

Most of Leonardo’s writings on sculpture, aside from considerations of painting, are purely technical discussions like the treatise

on bronze casting related to the Sforza monument that was incorporated into *Madrid Codex II* (Ms. 8936, fols. 144–157v, dated 1491). Leonardo argued that sculpture should be relegated to the mechanical arts. In one passage, known only from the *Trattato*, he states that *disegno*, defined as the outline (*lineamenti*) which surround the forms of the objects depicted, is the “deity” that “demands of the sculptor that he finish his images with knowledge” (*Codex Urbinas*, ed. McMahon, n. 102; see discussion at CN 9; compare CA 277 v–a, ca. 1513–1514 discussed in CN 36). This argument can also be compared to CA 245 v–b, ca. 1506–1508, where, in a discussion strongly reminiscent of Galen, Leonardo praises the “mirabile necessità” which constrains all effects in nature to participate in their causes: no *ingegno* or language could explicate such marvelous necessity which “directs human *discorso* to divine contemplation.” This necessity causes “species of all the universe” to unite in a *puncto naturale* and intersect at the pupil of the eye (see Galen, on necessity, *De usu partium* 2: 62, compare *Parte Prima*, Chapter 1 and see note *sub numero*).

As early as *Ms. A* (now *Parte Prima*, Chapter 38), ca. 1492, Leonardo used the word “discorso” to refer to the double method of argumentation that unites effects with causes and causes with effects. He adopted this language, which may derive from Galen, to investigate his optical problems in which painted relief was discussed, traditionally, in terms of the “excess and defect” or “intension and remission” of the quality of painted color, compared to actual sculpted relief. According to optical theorists like Alhazen, Oresme, and others, “common sensibles” such as position, distance, and motion are perceived according to two different modes: by perceiving the circumference or shape of an object and perceiving the parts which make up the whole. A greater chance of error or deception results from the second mode, as in the case of imitated relief which deceives judgment of depth through a surface of color gradations (Marshall, 1981, citing Alhazen, *De aspectibus* 2.29). Alhazen’s discussion of the second mode of perception included a consideration of the illusion involved in foreshortened figures, an important precedent for Leonardo’s argument. According to the Italian translation Leonardo may have known, the imagination perceives foreshortened figures to be at equal angles, whereas they are actually at unequal angles and are not at equal distances (*Vaticanus Latinus 4595*, fol. 52 r–a, “e lo viso scorgie tuta questa dispositione . . .,” cited in Federici–Vescovini, 1980, 136; on Leonardo’s knowledge of this manuscript, see Chapter Three).

CN 37

Like several others in the *Parte Prima*, Chapter 37 defines the value of the product, or final cause in the case of things ordered to production, by the contribution of the maker, that is, in terms of efficient cause (see also CNs 8, 26). The discussion is about the means and ends of imitative art. Much of the discussion recurs in Chapter 38, excerpted from *Ms. A*, where the comparison between painting and sculpture is closely related to the comparison of painting and poetry that became Chapter 19 of the *Parte Prima*. The present argument begins by considering how nobility is due to material cause: the nobility of sculpture is judged to rest with the durability of its material. Consequently, if nobility is defined as that which is eternal, sculpture is more perfect than painting. But Leonardo counters this argument by claiming that equally permanent paintings can be produced in glazed terracotta. Then he adds that the “speculations” of the painter give painting more “perspectives” than any kind of sculpture, so that the nobility of painting is greater because of the perceptible artifice of its grand “perspectives.”

Leonardo’s praise for *chiaro e scuro* as the “grandissimo discorso” of painting could be construed as a response to Dio Chrysostom’s argument in the *Twelfth Olympic Oration*. Chrysostom praised the supreme difficulty of working marble; Leonardo argues on the contrary that the difficulty of working marble is due to the material and not the artificer. Leonardo might even have known Chrysostom’s text directly, since the first edition was published in 1440.

Leonardo’s description of paintings glazed on metal or terracotta may be a parody of humanist claims for eloquence. His reference to the need to polish vitreous glaze to make it “smooth and lustrous” is grossly inaccurate from a technical point of view (compare Pope–Hennessy, 35–36) but corresponds precisely with a conventional metaphor for polished diction (on figures of diction, called “colors,” see Murphy). According to Cicero, the suave style avoids rough collisions of sound and extravagances of light and shade; this description of good literary style underlies Alberti’s discussion of “reception of lights,” which returned the optical metaphor to a visual context (see Baxandall, 1971; compare Cicero, *De oratore* 2.97–148, a prime source of humanist defenses of rhetoric). Leonardo’s reference to the “knocks” endured by marble sculpture may be another ironic reference to humanist polemics; Francesco Landino attacks the “Latinitas” of humanists whose “worst blow” is their elegant but corrupt speech filled with logical errors (cited

by Vasoli, 1952, 125–126). It is even possible to read a note of autobiographical cynicism in Leonardo's reference to the "destruttori" of bronzes, since the bronze intended for Leonardo's Sforza monument was sacrificed to the war effort against the French in November 1494, and this passage, composed sometime between 1492 and 1499, could easily date after that great disappointment (on the history of the Sforza colossus see Kemp, 1981).

If the opening passage of Chapter 37 is indeed a parody, then the rest of the discussion, which includes an argument for the superiority of figures seen from many points of view, may also be tongue in cheek, or even paradoxical. Leonardo's discussion of *rilievo* suggests by the humanist practice of arguing all sides of a question, *in utramque partem disserere*, and his use of "figura" may echo humanist writers who used the same word to describe the basic elements of a mathematical argument or to refer to any kind of artificial rhetorical device (Baxandall, 1971; Vasoli, 1968). Thus, Leonardo's defense of perspective as "discourse," and particularly his description of the figure seen from all sides, may have sounded more like a witty allusion to a fifteenth-century audience. Again, Leonardo introduces the discussion of perspective by claiming that "painting has been joined to sculpture since eternity," which recalls yet another Ciceronian defense of rhetoric against the charge of sophistry (compare Cicero, *De oratore*, 3.16.59–61; see Seigel, 1968, 11–12).

CN 38

The sixteenth-century editor constructed this passage from two others, one still extant in *Ms. A*, the other from an unknown source. A similar procedure resulted in Chapter 31, a pastiche of at least three fragments, and in Chapter 43, where the last paragraph is excerpted from *Libro A* and the original source of the rest is unknown. The major part of Chapter 38 is excerpted from *Ms. A*, fols. 105r–104v, ca. 1492. One portion of the passage excerpted from fol. 104v is given out of order, at the end of the *Parte Prima* (fol. 28r of the *Codex Urbinas*). As the original editor explained (in a note preceding the addendum), because the discussion runs backwards in the original manuscript, one part was initially overlooked and should be inserted midway through the main entry (at the juncture marked with a "W" on fol. 23v of the *Codex Urbinas*). The excerpted portion from fol. 105r of *Ms. A* begins at this juncture, and a third part of Chapter 38 follows it, excerpted from a different source no longer extant. The original order of the folios in the *Codex Urbinas* has been retained here.

The two texts that compose Chapter 38 are well married. The discussion from *Ms. A* is an argument for artificial, as opposed to natural, artifice, set out as the difference between material and efficient cause, where Leonardo argues that perspective in painting is due to efficient cause, that is, the artificer, while the perspective of sculpture is due to nature. The section from the second, lost source begins with a clear statement of these differences and proceeds with a discussion of how the product is manufactured in each case. This discussion of procedure complements the discussion of “*accidentale arte*” in the first part of the chapter, where Leonardo elaborates how the painter, by means of perspective, imitates the accidents of nature (on “*accidentale arte*,” see CN 12).

In the original context of Chapter 38 in *Ms. A*, Leonardo discusses how the painter’s *ingegno* “ought to be the similitude of a mirror which transmutes itself into the colors of things that are its objects” (*Ms. A*, fol. 82r). In *Ms. A*, he defined a number of problems related to this, such as accounting for the different appearances of painted relief and actual relief which has “diminution” (fol. 98v), or comparing the image seen in a flat mirror with painting in terms of the function of vision (fol. 104v); and considering how *grazia* in painted relief is achieved through the subtle transition of shadows and lights, and by “*bello*” effects of colored light (fols. 100v, 101v, 102r, 112r). His considerations of pictorial relief are interwoven throughout with investigations of vision, judgment, and the combinatory powers of the *fantasia* or *immaginativa*, with which the painter produces the “ornaments of the world” by considering the *qualità* of forms in nature (fols. 102v and 100r, now *Parte Prima* Chapter 12; for other passages on *giudizio*, see *Ms. A*, fols. 106v, 108r, and 98r on the *discrezione* of shadows and places).

The earliest treatment of these subjects in *Ms. A* follows the order of exposition in Alberti’s *della Pittura*. In the first pages of his manuscript, Leonardo describes how to prepare a wood panel for painting (fol. 1r, ca. 1490; see Kemp, 1977). This remark occurs together with statements about *rilievo*, *disegno*, and *anima* in which he outlines the plan of study taken up in the final twenty-five pages of the notebook, finished perhaps only two years later. He discusses the *aria* that animates a face (fol. 1r; compare fol. 100v); the path of vision that leads to the *impressiva* (fol. 1r; compare fol. 99, Chapter 19); the *ingegno* of a painter which resembles a mirror (fol. 1v; compare fol. 104v); and the comparisons (*paragoni*) of light and shadow, which are heightened by contrast and therefore confuse the painter (fol. 4r; compare fols. 84r, 103v; and see Chapter Three.). He also gives short definitions of painting as perspective,

and of perspective as reasons (*ragioni*) confirmed by experience (fol. 3r; compare fols. 36v, 81r, 92v, 98r, 103r).

Considering the extent of Leonardo's investigations of formal optical theory by the time of *Ms. A*, it is perhaps surprising how close these considerations seem to be to Cennini's *Il Libro dell'Arte*, ca. 1390. Cennini also credits the *fantasia* with the power to compose imaginary figures, as does the poet, by an "animo gentile" which delights in drawing (*Il Libro dell'Arte*, Chapters 1 and 2); and says that painting begins with drawing (*ibid.*, Chapter 5: "first, take a little boxwood panel"; compare *Ms. A*, fol. 1r). Drawing establishes relief, for which the painter uses a natural model and lets sunlight be the "helm and steersman" (*Il Libro dell'Arte*, Chapter 8; compare *Ms. A*, fol. 93r, "perspective is the bridle and helm of painting"). Leonardo followed Cennini's program no further than Chapter 9 of *Il Libro dell'Arte* (on establishing a system [*la ragion*] of lighting and *chiaroscuro* to endow figures with a system of relief), but the correlations are significant. The workshop tradition (that Cennini's handbook represents) also influenced Leonardo's reading of Alberti in later sections of *Ms. A* (beginning on fols. 36–41). Moreover, Leonardo's valuation of the painter's *fantasia* at the beginning of *Ms. A* is directly in line with the course of his subsequent investigations of *rilievo* and the imagination, a subject that Alberti had never discussed (see CN 19 and Chapter Three).

Connections between Leonardo's discussion of procedures (such as *porre e levare*) and Cennini's discussion of *fantasia* can be reconstructed in the context of *Ms. A*, where Leonardo identifies the "ten functions of the eye," derived from optical theory, with the *ingegno* of the painter transmuted like the surface of a mirror and aroused to new inventions by fantastic forms suggested in stains on walls (*Ms. A*, fols. 82r and 102v). In a passage preserved only in the *Trattato*, (*Codex Urbinas*, fols. 61v–62r, ed. McMahon, n. 261), directly related to the discussion of *ingegno* on fol. 102v of *Ms. A*, Leonardo advises the painter not to use "terminati lineamenti" in composing the *istoria*, for it may afterwards prove difficult to alter such graceful arrangements to make them more appropriate to the "mental movements" of the figures. The painter will acquire greater praise for his art if first he makes the figures move appropriately to their "mental accidents," just as poets first revise their inventions substantively and only afterwards adorn them.

In Chapter 38, where Leonardo describes the procedure of the sculptor "taking away" material, he refers to the sculptor's mastery of "misura," or use of correct proportion in the process of carving; but he does not account for free invention in the initial stages of

modeling or sketching to arrive at the best expression of a figure's "mental movements." Leonardo does allude to such a stage in his description of the process which begins with modelling and ends with a cast bronze, and, indeed, his working definition of *rilievo* was far more complex than his polemics suggest. In discussions of painting, he describes excellent foreshortenings, *rilievo*, and "alert movements" beginning with preliminary inventions that are worked out in drawings adjusted according to the artist's *ingegno* or *fantasia* (two nearly indistinguishable terms in Leonardo's vocabulary: see CN 2). New methods of "sketching" in stone were developed by Donatello in working low relief (a practice that Leonardo praises here for its ability to render perspective), but drawing techniques were applied to monumental sculpture only with Michelangelo, about a decade after Leonardo's discussion in *Ms. A* (on Michelangelo's revolutionary techniques in the *St. Matthew* see Summers, 1981, 97–102). Perhaps Leonardo would have fabricated a different defense for painting if he had had Michelangelo's precedents in mind.

CN 39

Leonardo must have combed Alberti's treatise on painting for references to *ingegno*, since he apparently collated four passages that refer to Alberti's discussion of the manner in which the painter should use his *ingegno* to compose *istorie*. Alberti (*On Painting* 3.53) makes the same claim as Leonardo that "inventions or compositions of *storie*" are the final aim of painting, except that Alberti identifies invention with the literary devices of poets, while Leonardo refers only to the formal inventions of foreshortening, color, and perspective (which Alberti discusses as "compositio" in Book 2.35 ff.). The most obvious links between Alberti's treatise and Chapter 39 are the references to two technical aids useful to the painter, a "sheet of glass" and a transparent veil, mentioned by Alberti in Book 1.12 and Book 2.31–32 respectively. Although the manuscript source from which Chapter 39 was excerpted is not known, Leonardo discussed the same technical devices in *Ms. A*, in two separate paragraphs on fol 104r (*Codex Urbinas*, ed. McMahon, nn. 118 and 119). Leonardo's elaborations of Alberti in these two discussions point beyond either text to workshop practices known to both writers. For example, in another description of the transparent veil stretched on a frame (*Codex Urbinas*, ed. McMahon, n. 119), Leonardo, unlike Alberti, recommends placing a drop of round wax on the network to serve as a reference point. Many

passages in the last part of *Ms. A*, ca. 1492, from fol. 97v to the end of the manuscript on fol. 114, are based directly on Alberti's text (see CN 19).

Both passages of *della Pittura* on technical devices concern the manner in which the painter can outline surfaces to depict *rilievo*. In the second passages (*On Painting* 2.32), Alberti remarks that he will not listen to objections to his device. Leonardo raised the same objections as Alberti's "adversary," thereby qualifying his endorsement of labor-saving devices. Leonardo also took up Alberti's challenge that whoever wishes to try his talents (*ingegno*) should imitate the grid system of parallel lines with the eye alone. In *Ms. A*, fol. 106v, Leonardo described a number of practical exercises to sharpen the judgment of the eye ("giudizio d'occhio") and to satisfy the *ingegno*, by estimating figures (including foreshortened ones) visually and checking the accuracy of visual judgment with actual measurement.

Alberti's main discussion of relief construction occurs in Book One, where he teaches painters to represent surface alterations due to light and atmosphere with knowledge of "what is meant by proportional" (Book 1.12, 7, and 14). Accordingly, in Book 1.18, Alberti writes that the proportion of light and dark, or black and white, large and small, and the like, is always learned by comparison of properties visible in nature which philosophers call "accidents." Even when Alberti utilizes later Peripatetic sources like the *De coloribus* to discuss the effects of atmosphere and colored light, he follows Aristotle (compare Book 1.7 and 1.9, and *De coloribus* 793b14–794a15 and *passim*; Alberti's sources have been discussed most recently by Edgerton, 1969, and Ackerman, 1980). Leonardo's investigations of optics are directly in line with Alberti's distinctively Aristotelian conception.

However, by the time of *Ms. A*, Leonardo's knowledge of optical theory extended far beyond the discussion in *della Pittura*. Consequently, the passages that certify Leonardo's debt are those that repeat Alberti's distinctive and resonant language, as for example in his criticism of technical aids cited above, or in his remarks on figurative decorum (see *Ms. A*, fols. 90r, 98r, 108v–110v). Some of Leonardo's descriptions of how to achieve relief by comparative judgments of light and shadow also fall into this category. For example, the passages at the beginning of *Ms. A*, ca. 1490, probably reflect Alberti, especially *Ms. A*, on fol. 2r (the *ingegno* of a painter resembles a mirror; compare *On Painting* 1.6) and on fol. 4r (heightened contrasts in nature often confuse the painter; compare *On Painting* 1.12; see also CN 38). Many passages in the latter part of

Ms. A also concern pictorial relief, and one passage, a later version of the discussion on fol. 4r, is especially relevant to Chapter 39. On fol. 106r, Leonardo counsels the painter to attend first to *disegno*, in order “to demonstrate the intention and invention of forms made first in the *immaginativa*, by adding and subtracting” (*llevando et ponendo*), and when satisfied with this to clothe the figures, adding color according to the demands of perspective. Related statements on artistic procedures occur on other folios, including fol. 112v, a page of scattered notes, where the surface of bodies “transmuted” by the color of object in its vicinity is compared to the painter’s own ability to transmute his mirror-like imagination into painted figures (quoting Dante’s *Convivio*; see discussion at CN 2).

In light of his synthesized study of Alberti, his extensive knowledge of optics, and his long experience as a practicing artist, it is not surprising that Leonardo often combined statements occurring at widely separated points of Alberti’s original text (as previously noted by Zubov, 1960). In the present passage, the concluding statement that “inventions of compositions of *storie*” are the “final aim” of the science of painting paraphrases Book 3.53, while the immediately preceding statements, which have just been discussed, are based on Book 2.31–32. The discussion of sculpture as something which the “painter always needs to understand” is also borrowed from Alberti. Leonardo’s argument that painting is more difficult because it requires knowledge of shadows, lights, and perspective can be referred to Book 3.58–59, where Alberti recommends that the painter depict nature in part by imitating the work of others. Alberti states that it is preferable to “take as your model a mediocre sculpture rather than an excellent painting,” and also to practice sculpting in order to paint correctly: “for relief is more easily found by sculpture than by painting.” Leonardo turned Alberti’s descriptive discussion of sculpture in the context of painting practices into a polemical argument that describes how the painter uses his *ingegno* to compose paintings. The following paragraph of Alberti’s text makes a statement quoted directly by Leonardo in another polemic against sculpture, in *Ms. A* (now Chapter 38): whatever remarkable model the painter observes and copies, he should decide first in his own mind what he is going to do because it is “easier to remove errors with the mind than to erase them from one’s work.”

It is difficult to date the passage from internal evidence, and although the argument is closely related to Chapter 38 (ca. 1492), Leonardo continued to depend on Alberti even in his latest writings on painting, around 1515. Viewed in the overall context of his

Albertian remarks, Chapter 39 seems somewhat later than *Ms. A* because he seems less dependent upon Alberti's theoretical views while continuing to employ Alberti's descriptive formulas. His remarks on *ingegno* in later writings (such as *Ms. G*, fol. 23v) recall the Albertian admonition in Chapter 39 that actual relief without contrast of color is "loathed by the *ingiegni* of good painters." Many passages preserved only in the *Trattato* also attest to Alberti's influence. Of these, four passages (*Codex Urbinas*, ed. McMahon, nn. 249, 259, 384, and 430) refer to painting practices in terms relevant to the polemic against sculpture in Chapter 39. Leonardo discusses how the composition of the *istoria* will have excellent artifice if the painter first briefly sketches the movements of his figures. (See also McMahon nn. 404–411 on motion and "mental accidents; McMahon nn. 268–279, on composing relief with *varietà* and *copia*; McMahon n. 266, on foreshortening wherever possible in *istorie*; see discussion of evident artifice at CN 38.)

Leonardo however, departed from Alberti when he emphasized the role of "discorso." Leonardo sometimes described the functions of the eye as "visual discourses" (Chapters 6, 21, see notes *sub numero*). In Chapter 39, "discorsi" are, similarly, what both sculptor and painter search for when they imitate nature. And the painter's technical aids are referred to as discourses, but Leonardo also states that the painter should "learn to use his *ingegno* to discourse" rather than rely on technical shortcuts for achieving good *rilievo*. Leonardo's preoccupation with "discorso" may reflect recent trends in humanist rhetoric (see CN 20), but whatever his sources, his language refers to the painter's scientific methods, grounded in both experience and mathematics. Conventional descriptions of artistic procedures borrowed from literary and scientific sources imposed restraints on discussions of artistic theory and practice, but they also created links with other contexts such as religious *imitatio*, described in devotional manuals as advancing from outline to full color (see CN 8). Leonardo described religious *imitatio* in Chapters 8 and 27 of the *Parte Prima*, and perhaps there is a veiled reference at the end of the present passage in the word "procesione." (On the other hand, "procesione" may be simply a corruption of "precisione," as Ludwig first suggested; see the Reader's Note.)

CN 40

The passage can be dated around the time of *Ms. D* and *Libro A*, ca. 1508–1510, or perhaps slightly earlier. Pedretti (1964, 179) notes that the description of nature is similar to that in Chapter 41, excerpted from *Libro A*. Chapter 20 also includes a similar description, and, indeed, such encomia to nature occur in Leonardo's writings of every period. The reference to *disegno* and astronomy ("he will demonstrate the different heights of the stars . . .") echoes a similar reference to astronomy and to the common foundation of painting and sculpture in *disegno* occurs in Chapter 23, which can be dated to the end of the Sforza period; yet the language in which the function of vision is described suggests a later date. At the beginning of the passage, Leonardo distinguishes between "similitudes" of objects outside the eye and "real simulacri" at the pupil of the eye, terms that derive from the tradition of Roger Bacon and Robert Grosseteste, whose writings he had known since ca. 1486–1488 (Strong; Kemp, 1977).

The nature of images entered Leonardo's scientific investigations when he considered Bacon's notions of "species." Pecham was one of Leonardo's intermediate sources for the formulation that "similitudes" of bodies that fill the surrounding air "represent this body throughout space and on every side" (*Ms. A*, fol. 86v, ca. 1492, R. 63). The kind of distinction Bacon had made between external and internal images already occurs on CA 270 r–b, ca. 1490, where Leonardo considers the "opinion" that "certainly many things transmit the similitudes of the form together with the *spetie* of the powers (*potentie*)."¹ This passage belongs to Leonardo's prolonged investigation of the extromission theory of vision (that the eye has an active virtue and is not just a passive, recipient organ; see Strong). When he reconsidered the issue in *Ms. D*, ca. 1508, Leonardo wondered "why Nature did not distribute power equally to the *virtù visiva*" (fol. 1r). There he identified "simulacrum" as that which "impresses itself on the pupil of the beholder's eye" (fol. 1v); and "species" as that which the pupil of the eye receives (fol. 2v). Apparently, Chapter 40 makes the same distinction between "simulacrum" and "species."

The relationship between the "simulacrum" and the "species" is central to Leonardo's investigation of the *virtù visiva* in *Ms. D*, but terminology is not the only link to Leonardo's studies around 1508; his discussion of *basso rilievo* also suggests his investigations around that time. The context for the discussion of "species" in *Ms. D* (fols. 2v and 84) is an experiment in shadow projection which Leonardo

may have derived from Biagio Pelacani (who may be Leonardo's only precedent in these investigations; see Kaufmann, 265–270, citing other, similar experiments by Leonardo). In Chapter 40 Leonardo concludes that the depth (*obscurità*) of shadow cast by low relief is “false.” This argument also suggests connections to his scientific investigations of reflected shadows beginning around 1505. A number of parallels exist between Leonardo's studies of perspective around 1490 and around 1505. The earliest studies of problems related to shadow projection, based on Pecham and Euclid, date from around 1490 (for example, CA 270 b and c; CA 203). Leonardo's earliest systematic description of shadow projection occurs on CA 250 r–a, ca. 1490, an outline for a treatise on shadows; on a related sheet, CA 253 v–d, ca. 1490–1491, in a series of definitions he describes the surface of a body as its “skin” (see Pedretti, *Comm.* to R. 45–46, citing the text). In later passages Leonardo distinguishes more carefully between mathematical and physical entities; on *Codex Arundel*, fol. 131v, ca. 1503–1505, he writes that surface is perceptible, but it has neither matter nor substance and “may rather be called an imaginary idea than a real object” (see also W19151r, ca. 1508, R. 47).

These investigations can be related directly to Leonardo's optical terminology. He distinguished between linear perspective and the study of light and shadow from the early period on, but he articulated the differences categorically only at a late period (see Chapter Three). Linear perspective is the study of visual lines, but the fact that these lines are by nature mathematical and, therefore, not visible did not particularly concern him until the period when he distinguished between surface and body as respectively mathematical and physical entities. The terms of these differences between mathematics and physics, and between linear perspective and the perspective of light and shadow, are part of a polemical debate in Chapter 40, where the difference between linear perspective and light and shadow accounts for his defense of the visible artifice of painting. The argument against low relief as the “false” representation of shadows seems immediately related to investigations of cases in which viewpoint causes distorted, monstrous effects in the perception of relief (see also Chapter 44 and note *sub numero*). He argues that “the sculptor will show you natural things without artifice,” while the painter will be able to include all perceptible (*visibili*) things, such as color, the diminution of objects as they recede from the eye, and various kinds of transparency.

Leonardo's distinctions between mathematical and physical entities emerged with his study of Euclid around 1498 (an early

indication of his changing views is recorded on CA 68 v-a). Earlier, he characterized “visual lines” as being invisible (i.e., mathematical) only with reference to astronomy, a subject that seems to have entered his own investigations with respect to shadow projection (see Pedretti, 1977, 1: 151–152). Evidence that Leonardo’s later studies of shadow projection are indebted to writings on astronomy—perhaps by Pelacani, the first writer to include within optics the study of shadow projections treated by astronomers, or to the *Astrolabica* of Nicephorus of Gregorius—is strengthened by his definitions of painting, beginning around 1503–1505 (*Madrid Codex II*, fols. 62bis, 66v), which include astronomy as the study of visual lines (compare Chapters 6 and 17, the latter of which states that “the geometry of lines is blind without perspective”). Other references to astronomy occur in Chapters 28 and 23. (On artistic uses of Ptolemaic shadow projection, citing that Nicephorus of Gregorius’ *Astrolabica* was published in Giorgio Valla’s encyclopedia, 1501, see Bauer; Leonardo owned Valla’s encyclopedia: see Reti, 1974, 3: 92, n. 1).

Leonardo’s distinctions among “natural,” “accidental,” and “composed” (*chomposta*) perspective are a direct outcome of distinctions he made between the mathematical and the physical. As Martin Kemp (1977) recognized, these distinctions emerged only around 1508 (see Chapter Three). The wealth of detail in Chapter 40 is reminiscent of descriptions of shadows, such as the outline for a treatise on CA 132 r-b, ca. 1508 (R. 42). When he writes that the “demonstrations” that the painter “praises” concern size, darkness, position, and distance, the language recalls another passage preserved only in the *Trattato* (*Codex Urbinas*, ed. McMahon, n. 841, ca. 1506–1507, according to Pedretti), where the “four fundamentals” of painting, with respect to shadow, are listed as quality, quantity, location, and figure, with the addendum of “aspect.”

Leonardo’s earliest notes on perspective take up the perception of pictorial images as opposed to natural objects. Optical writers had repeatedly considered the problem of how to judge depth, that is, how to explain the difference between a painted imitation and actual fluctuations in the convex and concave parts of a surface (see Chapter Three). Alberti (*On Painting* 1.7) also alludes to this traditional “fallacy of vision,” discussed by late Scholastic writers in terms of the change of quality from black to white (i.e., “intention and remission” of qualities; see Stump for an introduction to the issues). On CA 85 v-a (R. 51), and CA 309 r-b, both c. 1479–1480, and among Leonardo’s earliest notes on perspective, he discusses how the parts of objects seen in peripheral view are

distorted, and he accounts for these anomalies of vision as part of the process of judging depth. From the later notes in *Ms. A*, where he considered why sculptural relief will always look different from painted relief (fol. 99r), to his last writings on *rilievo*, Leonardo compared actual sculptural relief and images projected on a flat surface as a problem of judgment relevant to painted imitation (among Leonardo's latest statements is *Codex Arundel*, fol. 188r, R. 231, c. 1518; see further, Appendix 2).

CN 41

The passage is excerpted from *Libro A*, Carta 29, c. 1508–1510, the notebook Carlo Pedretti reconstructed (1964) on the basis of texts included in the *Codex Urbinas*. Although there may have been other, unrecorded passages on Carta 29 (the abrupt transition from Carta 29.49 to Carta 29.50 may indicate a lacuna), Pedretti indicates that in its original context, the argument excerpted as Chapter 41 concerned the relative nobility of sculpture and painting due to their durability (compare the end of Chapter 43, Carta 29.49). These two passages repeat in a brief, schematic manner arguments for nobility from efficient and material cause presented in Chapter 38, excerpted from *Ms. A*, fols. 105r–104v, c. 1490–1492.

In *Libro A* Leonardo maintains that the artifice of painting is more extensive than that of sculpture, which is aided by nature. Elsewhere, in his polemics against poetry, Leonardo maintained the superiority of the painter's artifice, which simulates by means of perspective. Sixteenth-century apologists for sculpture countered that sculpture is superior because it is closer to nature and therefore less artificial (see Chapter Four). Leonardo's position on artifice is clarified by the present argument, which rests on the difference between the way the boundaries (*termini*) of objects are represented in painting and in sculpture. Sculpture is limited to treating all *termini* equally, so that the edges further away from the viewer will be represented as distinctly as the edges of a nearby object ("the air interposed . . . will not fill the space . . . more . . ."). This criticism has an early precedent in *Ms. A*, fol. 99, c. 1492, where Leonardo writes that the reason a painting appears different to the eye than a sculpture does is that the lines come together without diminution in painting: the planes of the painting "all touch at the same *termini*," while the lines that are found between the eye and a sculptural relief are of varied lengths. During the fifteen years intervening between *Ms. A* and *Libro A*, Leonardo developed the argument that sculpture does not depict the loss of distinctness due to distance

specifically with respect to the problem of *disegno* perceived as the relationship of outline to internal modeling. Leonardo treated the problem of *disegno* together with the problem of color, and in *Libro A* the comparisons of painting and sculpture immediately precede passages devoted to color, a major consideration in his late studies of shadows. The late solution to both problems of representation is that lines can represent the perceptible edges of objects which reflect light in certain circumstances favorable to the viewer's comprehension of *rilievo* (see Chapter Three). CA 277 v–a, c. 1513–1514, outlines a treatise on light and shadow that Leonardo planned and in large measure must have carried out at the time of *Libro A* (see Pedretti, Comm to R. 111).

In its original location in *Libro A*, Chapter 41 followed an Albertian discussion on the representation of emotions, on Carta 28.47 (compare *On Painting* 2.42), of which another draft appears on Carta 33.63, following several more passages derived from Alberti (Cartas 32.55–59, 33.62; compare *On Painting* 2.40–44). Pedretti argues that Leonardo must have returned to Alberti's treatise on painting in the period when he composed *Libro A* (1964, 60, n. 70, citing Clark's remark that Leonardo's discussion seems to derive from the Latin version of Alberti's treatise). Leonardo's late "paragone," CA 305 r–a (R. 831), c. 1506–1508, is considered by Pedretti as a "draft" of Chapters 41 and 45 (the latter excerpted from *Libro A*, Carta 17.18; see CN 45). But similar commonplace arguments occur in many other statements of various dates, such as *Parte Prima* Chapters 15, 19, 20, 35, and 42, and CA 215 v–d.

CN 42

This argument is a variation on Chapter 38, ca. 1492, excerpted from *Ms. A*, which distinguishes between natural artifice and artifice created by art in order to praise the painter's *ingegno*. In the present chapter, the term "operator" also recalls comparisons between painting and poetry in which Leonardo argues that the painter's inventions imitate the actual "similitudes" of nature whereas the words of the poet are merely "accidentals created by lesser authors" (see CN 7; compare Chapters 14 and 26).

The comparisons of painting and sculpture also stem from the claim that the nobility of art should be judged on the excellence of its artifice, which is due to the artist. In Chapter 38, the imitation of relief is identified as the painter's "accidentale arte," and the arguments in both Chapters 38 and 42 rest on the Aristotelian definition of "accidentals" (see the introduction to section two of

the commentary notes). By the converse of the argument that the painter produces the similitude of relief on a flat surface, the sculptor produces the “similitude of a single flat surface” since his operations are limited to shaping material which, in the final product, is still a single surface ornamented with the (natural) artifice of actual chiaroscuro. Thus, deprived of light, sculpture is all “one bright or dark color” (this line of reasoning suggested to Galileo the possibility that the semblance of a flat surface could be painted on a sphere: see Chapter One).

Chapter 42 was probably composed during the Sforza period. In addition to the opening comparison of artifice in nature and art, there are other extensive repetitions of Chapter 38. Pedretti (1977, 1: 83, misnumbering passage 43 as 44) believes that Chapter 43 is a continuation of Chapter 42, and “appears to be the final version” of Leonardo’s polemical comparisons of painting and sculpture, datable c. 1510 (on problems of dating, see CN 43). But the discussion of the sculptor’s procedure for carving muscles, which Pedretti (1977, commentary to R. 796) singles out as evidence of Leonardo’s late literary style, also occurs in Chapter 36, which he justifiably dates c. 1492 (1964, 178).

The main argument in Chapter 42, that the sculptor cannot work without the particular light that creates sharply defined relief, continued to interest Leonardo as late as 1513–1515 when he wrote perhaps his final comparison of painting and sculpture on CA 277 v–a (given in Pedretti, 1977, 1: 83–84). As in the present chapter, Leonardo describes how the sculptor cannot work without shadow and lights to see the progress of his work, while painting, by means of imitated shadow and lights, makes surfaces appear concave (*concavi*) and projected (*rilevati*), and separated from each other at varied distances. The two paragraphs (R. 794) in which this discussion takes place, from a sheet devoted to optics, compose not a defense of painting but rather an encomium to the “science of shadow and light,” without which “painting, sculpture, astronomy, and great part of perspective, and similar things” would be nothing. The issue is the manner in which the eye needs shadow and lights to “discern the figures of bodies inside their boundaries (*termini*),” and the point of comparison between painting and sculpture, repeated in Chapter 42, concerns the nature of relief: the “projections and concavities” depicted in paintings and sculptures (places in paintings, and muscles in sculpture).

Leonardo’s reference to the manner in which the eye judges figures, and his demonstrations in adjacent paragraphs of how “species” produce compound shadows, suggest that comparison of

painting and sculpture derives from optical literature comparing feigned and actual relief (see the introduction to the Commentary Notes on sculpture). According to Alhazen, (*Optics* 2.3.52, ed. Sabra, 142; following Ptolemy, *De optica*, ed. Govi, 53–54, and ultimately Aristotle), color is the sole means by which the sense discerns (*dignoscere*) the motion of species of images directly, without ratiocination, by seeing the surface of a body over which light falls. We know figure and magnitude from the boundaries (*termini*) of colored things, while we know place from figure in conjunction with the surrounding medium, in the same way that color designates diverse figures in multicolored images. Fallacies of judgment, according to Ptolemy, like the erroneous judgment of apparently mingled reflected colors, or the illusion of motion, are due to the discerning powers (*virtuti discernitivae*) of the imagination (*imaginatio*): when these powers of the imagination judge a temporal sequence of “accidental predicates,” error can occur in the mental process of inference (compare Alhazen, *ed. cit.*, 287ff.). We judge accidental predicates when the figure is “unknown,” as is the case when a sculpted concavity appears convex, and vice versa. We ratiocinate convexity and concavity on the basis of visible rays, and when we do so falsely, we experience things as equal which are not, as when we judge the larger thing to be nearer, or when the darkness between stars appears to be remote and the stars appear to be near owing to their clarity (compare Alhazen, *Optics*, 3.7.39–43).

Leonardo’s comparisons of painting to sculpture in terms of outline, relief, and color are fundamentally indebted to this conceptual language, repeated in the optical literature by sources directly known to Leonardo (see Chapter Three). The argument in Chapter 42 and the elaboration of the same argument on CA 277 v—a stress the mind’s ability to discern the most subtle relationships between light and shadow in “universal light.” And in many other places, Leonardo characterizes these judgments as the “mental discourses” on which the excellence of painting is also judged.

CN 43

Like the previous chapter, Chapter 43 repeats arguments first recorded during the Sforza period. The opening statement appears also in Chapter 38, excerpted from *Ms. A*, ca. 1492. The argument that the sculptor makes only two figures in half-relief appears also in Chapter 37, while the related argument that the sculptor does not really create infinite points of view appears also in Chapter 36.

Pedretti (1977, 1: 83) suggests that Chapters 42 and 43 form one continuous text, since the title of the Chapter 43 originally read “scusatione dello scultore.” However, the polemics against sculpture are so similar to one another that the arguments can be combined smoothly in a number of permutations—a procedure followed by the sixteenth-century editor (see the Introduction to the *Parte Prima* texts). In fact, Chapter 43 is proof that the original editor did fabricate a new polemic out of fragments, because the last paragraph is excerpted from *Libro A*, Carta 29.49) see CN 41).

CN 44

This brief passage originally followed the last paragraph of Chapter 43 in *Libro A*, c. 1508–1510, Carta 29.50 (see CN 41). Leonardo’s criticism of sculpture is related to his studies of distortions in perspective around 1505, and particularly to his studies of shadow projection also beginning around the same time. An early indication of Leonardo’s later studies of reflections occurs on CA 250 r–a, c. 1490 (R. 111), where he outlines an intended treatise on shadows of whose seventh book will concern the “various lengths and colors of reflected rays.” The project seems to have been carried out with extensive experiments after ca. 1505 (see Veltman). A connection between Chapter 44 and these studies occurs on CA 177 r–b, c. 1508–1510 (R. 184), where Leonardo considers the nature of derivative shadows, noting that intersecting simple shadows are not duplicated; and on CA 335 r–a, c. 1508–1510 (R. 178), where he describes how species entering the pupil “throw themselves to the right or left.” Another reference to multiple shadows occurs in Leonardo’s criticism of sculpture in Chapter 37, where he states that when a work in *basso rilievo* is lit from below so many shadows result that the sculptor’s work is nearly incomprehensible.

Perhaps the studies most closely related to Chapter 44 are those that concern distortions from the viewer’s vantage point. Beginning with his early writings, Leonardo, following traditional optical theory, schematically reduced the eye and the sun to single points (see, for example, *Ms. A*, fol. 113 r–v). On *Codex Arundel*, fol. 62r, c. 1508 (R. 109), one of the earliest passages to distinguish between “accidental” and “natural” perspective, Leonardo considered the effects of distortion caused by this schematization when an image on an inclined plane is viewed offside. This extreme test of central point perspective constructions led him to formulate the idea that natural perspective, that is, perspective seen by the eye

directly, can be complemented by artificial perspective to “conceal the defects which would otherwise seem monstrous” (see Pedretti, *Comm.* to R. 107–109; for a review of the issues, see Pedretti, 1964, 164–174; for a review of the scholarship on Leonardo’s studies of anamorphosis and “curvilinear perspective,” see Elkins, 1988).

CN 45

This chapter is the last of four passages in the *Parte Prima* excerpted from *Libro A*, c. 1508–1510. In Pedretti’s reconstruction Chapter 45 is assigned to Carta 17.18, juxtaposed between two discussions of pictorial perspective. The argument in Chapter 45 is a familiar one: the central contrast between natural relief and the artifice of feigned relief already appears in *Ms. A*, fols. 105r–104v, Chapter 38. In fact, Chapter 45 is a revision of this earlier argument that sculpture requires “certain lights,” while painting carries light and shadow entirely within itself and thus gives relief to flat things, and distance to things nearby. The polemic in Chapter 45 is elaborated in several other passages in *Libro A*: Carta 16.14 gives a rule of proportion for varying degrees of distinctness of *termini* at different distances from the eye (compare *Ms. A*, fol. 84r, discussing how the comparisons [*paragoni*] of light and dark may confuse the painter because juxtapositions of white and black heighten contrast; *Ms. A*, fol. 100r, Chapter 31, paragraph 1; and *Ms. A*, fol. 103v, discussing the variable discernibility of *termini*); and Carta 25.35, Carta 25.38, Carta 31.53, and Carta 49.99 all addressing the problem of how to make figures appear detached from their backgrounds by composing contrasts of value (compare *Ms. A*, fol. 90r, on the reasons why painted relief will never seem as detached as natural things; and *Ms. A*, fol. 101v, on heightening contrasts of light and shadow to aid the “finto rilievo”).

Chapter 45 elaborates on the familiar argument that nature creates relief for the sculptor, by claiming that sculpture deprived of light will appear as a single flat surface. Pedretti (1964, 54–55) has argued that Castiglione was aware of Leonardo’s late comparisons of painting and sculpture, but the present argument is an exception. Indeed, all the comparisons between painting and sculpture in *Il Cortegiano* can be found in *Ms. A*. The argument in Chapter 45 was repeated by Galileo (see Panofsky, 1954, who did not recognize the similarity; and Edgerton, 1984). Pedretti has assembled evidence for Galileo’s knowledge of Leonardo’s writings through Pietro Accolti, and more recently the scholarship has suggested that Leonardo’s writings reached Accolti through Matteo Zaccolini

(see Pedretti, 1977, 1: 36–47, on his rediscovery of the Zaccolini notes; Bell, 1988; Cropper, 1980, 577 ff; see also Kaufman, Dempsey, and Veltman). Whether or not these Seicento writers knew Leonardo's manuscripts directly, their discussions of pictorial perspective all depend on the same sources in Euclidean geometry and the optical literature. Leonardo's statement in Chapter 45 that the painter places the "true quality and quantity of the shadow and lights" by "subtle investigations" hints at the systematic nature of Leonardo's later studies, of which there are distinct echoes in early academic teaching practices (see Barzman, 1986; and Goldstein, 1988, for a summary of the scholarship although he concludes, contrary to the evidence in my opinion, that there is insufficient evidence of teaching academies prior to the Carracci School). Leonardo lists the colors belonging to pictorial perspective, and this emphasis on color, especially the relationship between reflected color and its systematic treatment in painting, typifies *Libro A* and other writings on light and shadow from the same period. Pedretti has assembled the major texts (1964, 146–151; see also Chapter Three and Appendix 1).

In *Libro A*, Carta 40.86, in discussing how every opaque body participates in the color of its object, Leonardo covers the mixing of pigments. This passage may, therefore, be interpreted as an indication that Leonardo intended to treat the theoretical and practical aspects of color jointly. On *Anatomical Manuscript C*, II, fol. 6 r–v (W19076), 1513, concerning the "quality" and "quantity, shape, and site" of shadows, Leonardo also refers to the "books on painting" (see Pedretti, *Comm.* to R. 287, [W19076r]). This passage echoes an earlier reference contemporary with *Libro A*, on CA 181 r–a, 1508, stating that the manner in which a surface partakes in the color of its object will be set forth in the "book on painting."

Alberti's discussion of *rilievo* is grounded in the same tradition of natural science, but he also drew upon rhetorical theory to advise the painter to use his *ingegno* to invent artificial combinations of color that add *copia* and *varietà* to the *istoria* (*On Painting* 2.48). Alberti's advice is patterned after Cicero's prescriptions for *elocutio* in the middle style, using rhetorical figures based on the principle of antithesis (see Summers, 1977). Alberti set an important precedent for later Renaissance writers, Leonardo among them, when he discussed the emotive content of artificial constructions of color (*On Painting* 2.48; his precedents are Horace's discussion of appropriate artifice [*Ars poetica*, lines 14 ff, 73 ff.]; Pliny's critical discussion of austere and florid color [*Hist. nat.* 35.30]; and Aristotle's division of

mimetic effects into the antithetical categories of *ethos* and *pathos* [*Poetics* 1447a16]; see also Pollitt, 37 ff.)

In the late writings on painting, such as *Libro A*, and *Mss. E* and *G*, Leonardo discussed pictorial decorum almost entirely in formal terms of color and *rilievo*, distantly echoing Alberti's prescriptions for decorum and demonstrating how Leonardo forged a synthesis between science and visual art. The passages in *Libro A* directly related to the polemic on painting and sculpture in Chapter 45 provide immediate evidence of a lifelong pattern in Leonardo's writings (in addition to the passages cited above, see *Libro A*, Cartas 20.27, 21.28, 27.43, 29.51, 29–30, 30, 38.80).

CN 46

As the editor (Manus 3) explains in a note following this entry, the final chapter of the *Parte Prima* is out of order because it was discovered "after the whole book was written." The editor suggested placing the chapter either after Chapter 33 or before or after Chapter 26, a comment that indicates the existence of plans to publish the *Codex Urbinas* (see the Introduction to the *Parte Prima* texts).

Since Chapter 46 is a brief synopsis of more extensive arguments datable to the Sforza period, perhaps it is a late text, as Pedretti and Brizio suggest (see Pedretti, 1964, 123, with references). The passage is similar to the summary polemics against sculpture included in *Libro A*, c. 1508–1510. The initial argument that poetry excels in feigning words, painting in feigning facts, recalls the comparison between the works of nature and the works of man, known in several variants (compare Chapters 7, 14, 19, and 26). The manner in which this argument is set out as a proportional relationship is also reminiscent of Chapter 2, probably a late passage, and Chapter 23, c. 1492. Leonardo's entire apologia for painting in the *Codex Urbinas* ends on a paradoxical note that recalls Chapter 19, where he complains that painting has not been included among the liberal arts, and Chapters 31 and 34, in the latter of which he argues that few painters make a profession of letters because they do not need it to understand their profession (but that painting is no less noble for this reason). Kemp (1985, 198) has suggested that Leonardo may have been thinking of claims made by his Milanese colleagues competing for ducal attention, like Luigi Pulci's expressed desire to satisfy all tastes with poetic *fantasia* (*Morgante*, 18, 140 ff.).

APPENDIX 1

“Trattato Sequences” in Leonardo’s Writings

* “Trattato sequences” consisting of a definition of painting, and Albertian precepts on figurative decorum in painting, are marked with an asterisk. Other sequences are partial, as noted in the abbreviated descriptions of contents presented below. The analysis of the contents of these manuscripts has been corroborated by direct autopsy of the original documents. Unless otherwise noted, paleographic evidence (handwriting, ductus, color of ink or chalk) suggests that these are continuous passages of writing, rather than a piecemeal accumulation of statements recorded at various times.

I. *Ms. A*, ca. 1490–1492 (dated July 10, 1492 on fol. 114 verso)
Formal definitions of perspective are stated seven times: on folios 3 recto, 36 verso, 82 recto, 92 verso, 98 recto, 103 recto, and 105 verso. Beginning with the third repetition, on fol. 82 recto, the definition occurs as part of a longer sequence of topics which can be described as follows: a formal definition of perspective, discussion of problems of representation in imitated relief, and instructions for constructing paintings that recall Alberti’s precepts for composing the *istoria*, in Book II of his treatise on painting. Four passages that are interspersed with discussions of imitated relief were included in the *Parte Prima* (later titled the *Paragone*) of the *Codex Urbinas*.

1. Folio 3 recto

Definition: painting is based on perspective, perspective is a rational demonstration confirmed by experience; with four preliminary drafts on the same page. Repeated on 10 recto, in a discussion of the *virtù visiva*, which has within itself a single, indivisible point that confirms all the points of sectioned pyramids.

Related discussion: 1 verso: perspective defined as the intersection of the visual pyramid by a transparent plane; 2 recto and verso: discussion of “chorpo ombroso” and similitudes that every body extends “tutta per tutto e tutta nella parte” (2 verso). Perspective is discussed in terms of the diminution of colors and size on 8 verso, 9 recto, 10 recto. 10 verso, 11 recto, 19 verso, 20 recto (a discussion of “corpo bianco”).

Precepts: 23 recto: how the painter ought to depict *rilievo*; judgment of the painter.

2. Folio 36 verso

Definition: principle of perspective: all things send their similitudes to the eye by a sectioned pyramid near the eye.

Related discussion: 36 verso–41 recto: Albertian distant-point constructions (full Albertian construction on 41 recto), construction of foreshortened circles; diagrams of the visual pyramid; problem of the lateral distortion of images seen from a single viewpoint (also on 41 recto). (See Kemp, 1977, 132, suggesting that Leonardo's diagrams derive directly from Piero della Francesca, *De prospettiva pingendi*.)

*3. Folio 82 recto (foliation bound separately and known as *Ashburnham 2038* begins on 81 recto)

Definition (in preceptive form): the *ingegno* of the painter ought to be like the similitude of a mirror that is transmuted by the colors of the things that are its object.

Related discussion: 81 recto: on the movement of the eye and the image impressed in the *imprensiva* 82 verso–92 recto: problems of mechanics interspersed with discussion of optics. 84 recto: black and white heightened by juxtaposition confuses the painter (compare *Libro A, Ms. G*); 86 verso: diagram of the *radiosa piramida*, probably after Pecham; 90 recto: painting seen through a window from luminous places appears dark (compare *Madrid Codex II; Ms. E*, 17 verso; and *Ms. G*, 23 verso).

Precepts: 84 recto–90 recto: on the portrayal of relief, the mode of portraying figures in the *istorie*. 84 recto: on draperies; 84 verso: on the painter's studio, and its illumination; 88 verso: on the membrification of figures without too much *finito*; 90 recto: on portraying relief with good judgment and good rules; mode of portraying figures in the *istorie* with respect to the wall and placement of the eye.

*4. Folio 92 verso

Definition: every corporeal form is divided into three parts: *corpo*, *figura*, and *colore*.

Related discussion: 90 verso–92 recto: on effects of the source of light on shadows (with diagrams); 93 recto–97 recto: discussion of light and shadow interspersed with precepts. 94 verso: on the reverberation of lights; 96 verso: sunlight on the sea.

Precepts: 93 recto–97 verso. 93 recto: perspective is the bridle and rudder of painting (first chapter of the abridged *Trattato* [*Codex Urbinas*, ed. McMahon, n. 47]); 94 verso: on the small errors of painting; linear painting considers the serpentine boundaries; 97 verso: how youths ought to study perspective; precepts, including instructions on the number of figures in *storie*.

*5. Folio 98 recto

Definition: the three kinds (*nature*) of perspective: linear perspective, perspective of color, *prospettiva de spedizione* (how things appear less defined when they are further away).

Related discussion: 98 verso-103 recto: problems of representing perspective as relief. 100 recto: how to represent *corpi bianchi*; 102 verso: the ten functions of the eye.

Comparisons of the arts: 99 verso: painting and poetry.

Precepts: 98 recto-102 verso: on colors, draperies, how to represent the night, a storm, figures speaking together (98 recto, 101 recto). 102 verso: how to practice the perspective of colors, on the serpentinization of figures.

*6. Folio 103 recto

Definition: of linear perspective

Related discussion: 103 recto and verso: mode of making shadows accompanied by lights; on the indiscernible boundaries of figures near the eye.

Comparison of the arts: 103 recto: painting and music; 105 recto-104 verso: painting and sculpture.

Precepts: 103 recto-105 recto: how to place figures in the *storia*; aids to exercise memory.

*7. Folio 105 verso

Definition: of aerial perspective.

Related discussion: 112 verso-113 verso: on light, lustre, and the beauty of color. 113 verso: lustre in a mirror (compare *Madrid Codex II*, 25 recto).

Precepts: 105 verso-113 recto; 114 recto-verso: on representing faces, useful games for draughtsmen; painter in his studio; manner of composing figures in *storie*; on judging paintings, and rules for beginning painters; the harmony (*conventionone* of members; representing turned heads; how to square a body seen from below; how to represent Ingratitude.

II. *Madrid Codex II* (Ms. 8936), ca. 1503-1505 (dated November 30, 1504, on folios 25 recto and 125 recto)

Scientific discussions of painting concerned with the relationship between the light that the pupil of the eye can tolerate and the amount of light that reaches the internal sense of the *imprensiva*. The three sections on painting in this manuscript all refer this discussion to Albertian precepts about figure composition. However, Leonardo no longer considers the disposition of figures in relation to narrative composition as he had in *Ms. A*, but in reference to

light which makes the pupil contract. In his discussion of lustre, Leonardo determines where the observer ought to stand so that his point of view will not coincide with the direct path of light from the point of lustre.

*1. Folio 26 recto and verso

Definition: of lustre (compare *Ms. A*, 113 verso; *Ms. E*, 17 verso): fully-illuminated color is the most beautiful, and then lustre takes on more color of the reflecting body; on the difference between lustre in opaque and transparent bodies.

Related discussion: 24 recto: judgment of brightness and darkness by the *imprensiva* (with geometric diagram); 24 verso: discussion of lustre and the *imprensiva* (with geometric diagram: compare *Ms. A*, 113 verso); 25 recto: light and dark judged by the eye. 25 verso–26 verso: greatest beauty of wholly illuminated light, in relation to pupil dilation; 27 recto: discussion of pupil dilation and contraction, and the internal sense of the *imprensiva* in nocturnal animals and humans (compare *Codex Urbinas*, ed. McMahon, nn. 14, 19, and 22); 28 verso: dark objects against bright backgrounds.

Comparison of the senses: 25 recto: of sight and hearing, with reference to nocturnal animals.

Precepts: 25 verso: figures in the *istoria* will have more grace when placed in universal light rather than under many small lights, because it emphasizes relief (compare *Ms. A*, 94 verso).

*2. Folios 62 bis/recto–72 verso: This sequence contains three successive drafts for a definition of perspective:

a. Folio 62 bis/recto

Definition: perspective is a mathematical science.

Comparison of the senses: objects of sight and hearing (i.e., visual lines and music).

b. Folio 66 verso

Definition: perspective is a mathematical science that concerns continuous quantities: visual lines connect the object with the eye.

Comparison of the senses: the objects of sight, hearing, and taste.

c. Folio 67 recto

Definition: perspective is a mathematical science which mediates the senses in the first degree of certainty.

Comparison of the five special senses.

Related discussion: 46 verso–78 verso: problems of light and shadow. 47 recto ff.: discussion of rational proportions in arithmetic, the study of discrete quantity, and geometry, concerned with continuous quantity. 50 verso–62 verso: on reducing bodies to cubic form. 62 verso–70 verso: dividing cubes into pyramids (of light and

shadow). 70 verso: on pupil dilation and contraction in bright light (compare 25 recto–27 recto); 71 recto: light and dark on faces.

Precepts: 70 verso–72 verso, with occasional references until 78 verso: discussions of stylistic decorum (compare *Ms. A*, 108 verso, 109 verso, and 110 verso). 70 verso, 71 recto and verso: on the selection of places which give graceful relief to things; on the harmonious disposition of limbs (*membra* according to the position of the eye in relation to light (compare 25 recto; *Ms. A*, 90 recto; *Ms. G*, 23 verso). 78 verso: preceptive definition of the perspective of colors, their diminution with distance (compare 72 verso; *Ms. A*, 97 verso, 98 recto, 108 verso, 109 verso, 110 recto).

*5. Folio 127 verso

Definition: perspective in painting with reference to pupil dilation, the beauty of reflected color.

Precepts: 128 recto (recorded in a slightly more orange ink and neater handwriting): discussion of figurative decorum through careful placement of muscles, and shadows (how to achieve beauty of color and avoid ugly ones).

III. *Libro A*, ca. 1508–1510, as reconstructed by Pedretti from passages contained in the *Codex Urbinas*

Pedretti (1964) reconstructed the order of 107 passages according to their sequence in the *Codex Urbinas*, the order which has been followed here. The exact arrangement of passages on each folio cannot be determined, and the content of 40 of 96 folios is unknown. The pattern established in the two earlier manuscripts is less clear here, where folios 12–54 all concern painting, but echoes of the “trattato sequence” pattern are discernible. Discussion includes comparisons of the arts (of painting and sculpture). Consideration of the contrast of figure and ground, and the boundaries (*termini*) of objects is important throughout. Leonardo advises artists to construct artificial antitheses by manipulating simple contrasts of value for the sake of pictorial harmony.

1. Cartas 13 and 14

Precepts: discussion of decorum, variety

Related discussion: preceding and following passages discuss perspective, but Cartas 2–11 are entirely missing. Carta 16: on the outlines of figures, and the diminution of colors; Cartas 18–20.24: on color.

Comparison of the arts: Carta 17: comparison of relief in painting and sculpture (*Codex Urbinas*; n. 45; compare CA 305 r–a).

2. Cartas 24–33: a continuous discussion which can be described as two sub-sequences joined by passages on the comparison of the arts:

*a. Carta 24.34

Definition: on the three kinds of derivative shadows

Related discussion: Carta 24.32 advises the painter to study with rules (compare *Ms. A*, 92 verso, compiled in the *Codex Urbinas*, n. 47); discussions of perspective used in painting and Albertian precepts for figurative decorum are conflated in the discussions, but the following passages include considerations of perspective: Carta 27.42: on the fields of figures, oppositions of light against dark; Carta 27.44: on the boundaries of lights and shadows.

Precepts: Cartas 24–28, based on Alberti; of particular interest because they go beyond Alberti's considerations: Carta 24.33: on the decorum of gestures; Carta 26.38: on graceful relief, by detaching forms from their background; Carta 27.41: on enhancing beauty and ugliness through contrast; Carta 27.43: on harmonious combinations of color; Carta 27.34: on graceful boundaries of lights and shadow, and placement of light to demonstrate the primary beauty of colors.

b. *Comparisons of the arts:* Carta 29.48–50: three comparisons of painting and sculpture (*Codex Urbinas*, n. 41, the last paragraph of n. 43, and n. 44).

*c. Carta 32.60

Definition: on the nature of boundaries (*termini*) (compare *Ms. G*, 23 verso).

Related discussion: Cartas 29–30.67: discussions of perspective and decorum are conflated, as in the sequence above. The following passages include considerations of perspective. Carta 29–30: on composite colors; Carta 30.53: on detaching figures from their fields (*campi*); Carta 33.64–65: on original (*primitiva*) and derivative shadows; Carta 33.68: on simple and compound shadows.

Precepts: Carta 29.51–Carta 33.68, based on Alberti's statements about color in Books I and II of *della Pittura*. Carta 31.55–Carta 32.59, Carta 33.62–63: Albertian precepts on figurative decorum, *varietà* in the *istoria*.

*3. Carta 34.68

Definition: of two kinds of shadows.

Related discussion: Carta 34.69–Carta 39.80: discussion of shadows, aerial perspective, problems of relief.

Precepts: Carta 36.70–Carta 37.72: on the *istorie*. Carta 39.81–82: on figurative decorum.

*4. Carta 39.83

Definition: painting is the composition of light and shade combined with colors.

Related discussion: Carta 40.86–Carta 54.106: problems of relief, on reflected colors, colors in landscape, interspersed with precepts. Carta 40.86: on the color of reflected objects; Carta 49.99: light reflected off the edges of objects against dark backgrounds (compare *Ms. G*, 23 verso).

Precepts: Carta 40.84–Carta 51.105 (nn. 84, 85, 90, 94, 95, 97, 100–105): on figurative decorum, movement; the judgment of the painter.

IV. *Ms. E*, ca. 1513–1514, datable by the content of discussion. Problems formulated in *Madrid Codex II* concerning the relationship of external light to the *imprensiva* are continued in this manuscript. “Trattato sequences,” without comparisons of the arts, are still discernible.

*1. Folio 3 verso

Definition: the three kinds of lights that illuminate opaque bodies.

Related discussion: 3 verso: on aerial perspective; 4 recto: on lateral distortion.

Precepts: 3 recto–6 verso, conflated with considerations of perspective. 3 recto: consideration of the attitudes of figures in painting; 4 recto: varying light and shadow on figures; 6 verso: on figurative decorum, on foreshortening and the proportionality of figures relating the parts to the whole.

2. Folios 15 recto through 20 verso form a continuous discussion of painting that can be described as four sub-sequences:

*a. Folio 15 recto

Definition: painting concerns the proportionality of shadows and lights.

Related discussion: on the boundaries of bodies placed opposite the pupil of the eye (compare *Madrid Codex II*).

Precepts: on the movement of figures.

b. Folio 15 verso

Definition: natural and artistic perspective.

Related discussion: consideration of the size of objects seen in the pupil of the eye.

*c. Folio 16 recto and verso

Definition: Natural perspective and accidental perspective, made by art.

Related discussion: 16 recto–17 recto: problems of foreshortening, on the anatomy of the eye. 17 recto: portraying relief in painting.

Precepts: same folios, conflated with discussion of perspective. 16 recto: on the anatomy of movement. 17 recto: variation in the movement of limbs.

*d. Folio 17 verso

Definition: six propositions on light and color in relation to pupil dilation and contraction in humans and animals (compare 3 verso; *Madrid Codex II* discussions of lustre).

Related discussion: 18 recto: the beauty of fully illuminated apparent and painted color; 19 recto: color in landscape.

Precepts: 18 verso–20 recto: decorum and variety of figures, their anatomy, in painting; on the variety of light and shadow in landscape.

3. Folio 32 recto

Definition: on the three natures of derivative shadow.

Related discussion: 30 verso–32 recto: shadow and reflected color from objects. 31 verso: distinction between light and lustre (light is immobile on immobile bodies, lustre depends on the position of the eye).

4. Folio 80 verso

Definition: the first part of painting shows the relief of figures, generated by means of three perspectives.

Related discussion: 79 verso–80 verso: on perspective that diminishes opaque bodies; discussion of aerial perspective in terms of boundaries (*termini*).

V. *Ms. G*, ca. 1510–1515

The manuscript is dated January 9, 1515, on the verso of the front cover. Of all the intact manuscripts which contain discussions of painting, this one departs most radically from the “trattato sequence” pattern developed in *Ms. A*. There are still vestiges of the sequence, including seven formal definitions, and Albertian precepts. Considerations of landscape painting dominate the discussions.

1. Folio 5 verso

Precepts: on the variety of figures.

2. Folio 13 verso

Definition: simple and composite (*chompossta*) perspective made by art.

Related discussion: 11 recto: on good figuration in universal light; 12 recto–13 recto: precepts and discussion on portraying the varied light on figures by comparison of lights.

3. Folios 19 recto–30 verso can be described as a sequence composed of two sub-sequences:

a. Folio 19 recto

Definition (conflated with precepts): the judgment of the painter depends on three considerations: relief, light and shadows of the figures in the *storia*, comparison of the figures according to the *storia* (compare *Ms. E*, 80 verso).

Related discussion: 19 verso–23 recto: light and shadow in landscape, city scenes. 20 verso: aspects of landscape including the position of the sun, shadows of trees.

*b. Folio 23 verso

Definition: on the principal parts of painting, fields and boundaries of figures.

Related discussion: 24 recto and verso, 25 verso, 27 recto–30 verso: considerations of color, light, arrangement of trees, in landscapes.

Precepts: 24 recto–25 verso: on the accidental colors of leaves, shadow, light, lustre, and transparency. 25 recto: on knowledge required of youths disposed towards painting (compare *Ms. A*, 99 recto).

*5. Folio 32 recto

Definition: on the angle of vision in perspective, and the boundaries of figures in painting.

Related discussion: 32 verso–33 recto: on the ramification of plants.

Precepts: 33 verso: on deriving rules for the position of plants and figures with respect to light and shadow (compare 19 recto).

6. Folio 37 recto

Definition: on the boundaries of figures.

Related discussion: on the color of illuminated boundaries. (See also, 44 recto: accommodation of pupils in nocturnal animals: compare *Madrid Codex II*, 25 recto–27 recto.)

7. Folio 53 verso

Definition: discourse on painting: the three parts of perspective that concern painting.

Related discussion: diminution of colors in the transparent medium.

VI. Other "Trattato sequences" and related discussions on individual sheets

There are many passages related to the definitions of perspective recorded in Leonardo's discussions of painting, such as outlines for treatises on perspective and treatises on motion including optics (*Codex Arundel*, folio 232, c. 1490; *Codex Arundel*, folios 130–133, c. 1503–1505; CA 68 v–a, c. 1498; CA 132 r–b, c. 1508; CA 179 v–c, c. 1492; CA 203 v–a, c. 1490–1492; CA 203 v–a, c. 1490–1492; CA 270, c. 1490; CA 318 v–a, dated June 2, 1496; CA 360 r–a, c. 1504; CA 360 r–c, c. 1508, plan for a treatise or index on painting, not in Leonardo's handwriting [see Pedretti, 1964, 236–240, with English translation]). The most complete discussion of these passages is found in Pedretti, 1977, 1: 119–226. In addition to the passages cited below are many others preserved only in the *Trattato*, which awaits a modern systematic study correlated to notes extant in Leonardo's own handwriting.

1. *Quaderni Anatomici VI*, folio 22 recto (Keele/Pedretti, *Corpus of the Anatomical Studies*, nn. 99R and 100R)

Definition: paragraph 3: every opaque body participates in the color of its object.

Precepts: paragraphs 1 and 2: on the decorum of muscles, limbs; order of a book on human anatomy.

2. *Quaderni Anatomici IV*, fol. 15 recto (Keele/Pedretti, *Corpus of Anatomical Studies*, n. 117R)

Precepts: paragraphs 1, 3, 4, 7, and 8: on *varietà* in the *storia*, faults of the painter, treatment of drapery.

3. CA 277 v–a, c. 1513–1514

Comparison of painting and sculpture (see Pedretti, 1977, commentary to R. 111).

4. CA 305 r–a, c. 1506–1508

Comparison of painting and sculpture (see Pedretti, 1964, 124, who considers this passage to be a draft for *Libro A*, Carta 29.48).

APPENDIX 2

Guide to Related Passages in the Original Manuscripts

Cross-referencing Leonardo's writings is an endless task. The following selection constitutes the main passages I picked up while editing the *Parte Prima*. A summary of passages based on Alberti's *della Pittura* is cited in CN 39.

1. Sources of Definitions of Painting

Definitions in "trattato sequences" are cited in Appendix 1. Among the early definitions of painting are several that outline studies of perspective: CA 250 r-a, CA 253 r/v-c and d, *Codex Arundel* 232 r/v, all dated c. 1490; and CA 179 r-c, c. 1492. The contemporary *Codex Trivulzianus* (especially folio 68) contains similar notes on painting and optics. A number of additional folios dispersed in the *Codex Atlanticus* (CA 90 r-b, 270 r/v-b and v-c, 138 v-b, 135 r/v-b, 125, 141, 144, and 222) have been identified with CA 253 (and related to *Anatomical Ms. B*) as composing part of an early manuscript on traditional topics in optical writings that was used in the compilation of *Ms. C*, a treatise on perspective of c. 1490, and *Ms. A* of c. 1490-1492, which includes the most complete extant compilation of notes on painting (Brizio, 1954).

One of the earliest indications of a changed attitude towards the definition of painting is CA 68 v-a, c. 1498, where the definition of surface is presented with new mathematical considerations. The difference between mathematical and physical entities is explored in *Codex Arundel*, folios 130r-133v, 1503-1505, or perhaps slightly earlier (see Pedretti, 1977, Commentary to R. 45-46).

"Late" passages are: CA 132 r-b, c. 1508; R. 44 (a page Leonardo notated in Francesco di Giorgio's treatise on architecture, Ashburnham 361 in the Laurentian Library, Florence); W19151r (R. 47, 87, and 80), c. 1508; W19150v (R. 78), c. 1508; CA 182 v-a, c. 1507-08; CA 199v-b, c. 1506-1508; CA 91 v-a, c. 1515; CA 167 r-a, c. 1515; CA 154 r-c, c. 1510; W19070; CA 200 r-b, c. 1514-1515; CA 277 v-a, c. 1513-1514; *Codex Urbinas* folio 196v (ed. McMahon, n. 84); and in *Libro A*, Carta 25.8, c. 1508-1510; *Ms. E* (folio 79v) and *Ms. G* (folios 23v, 94v and 96v), c. 1510-1515. See also the passages defining the mechanical sciences cited in CN 28.

2. *Chronology of the Optical Writings*

For an overview of the chronology see Pedretti, 1977, 1: 119–120, 151–152, and Commentary to R. 45–46, 60, 111, 203–205. The scholarly consensus, insofar as one exists, is that the earliest writings (c. 1489) are connected with *Anatomical Manuscript B* (folios 20, 21, 22, 25) on the nature of vision. There is no clear consensus on a group of related folios in the *Codex Atlanticus* that have been connected with these early anatomical studies (Brizio, 1954; Pedretti, 1977), but may date as late as c. 1500 (Kemp, 1977). Plans for a treatise on linear perspective (*Codex Arundel*, fol. 232 r–v, c. 1490; and the “Proemio series” [see CN 1]), are dated close to *Ms. C*, c. 1490, a treatise on light and shade, and *Ms. A*, c. 1490–1492, with notes on optics, mechanics, and painting.

From 1493 through 1504, notes on optics are continued in *Mss. H, I, L*, and *M*, the Forster manuscripts, and individual sheets of the *Codex Atlanticus*. CA 150 r–a, c. 1500–1503, singled out by Pedretti, as an early indication of connections between Leonardo’s emerging interest in geometry as the study of continuous quantity and his optical studies investigating mobility in shadows (c. 1500–1503, see commentary to R. 112–116; and Kemp, 1977).

Leonardo’s interest in perspective increased around 1503–1505 with notes in *Madrid Codex II* that are developed in *Ms. D*, c. 1508, a treatise on vision that is probably part of a larger treatise on perspective (Strong), and the nearly contemporary *Ms. F*. A group of anatomical sheets containing optical studies (the “Windsor signature,” W19149r–W19152v) can also be dated c. 1508. The lost *Libro W*, a companion to *Ms. C*, and contemporary with the lost *Libro A* containing the most extensive discussions of painting, were both used in compiling the *Codex Urbinas* and were probably composed c. 1508–1510. The latest manuscripts to contain extensive notes on optics and painting are *Ms. E*, c. 1513–1514, which develops notes copied from *Ms. C*; and *Ms. G*, c. 1510–1515. Another Windsor sheet, W19076, c. 1513, which contains notes for a book on painting and optical writings, also belongs to this period.

Definitions of perspective recorded only in the *Codex Urbinas* can all be dated c. 1508 or later on the basis of content: McMahon n. 841 (fol. 196v); n. 484 (fol. 154v); n. 102 (fol. 50); n. 100 (fol. 50); and n. 99 (fol. 50).

3. *Comparisons of Painting and Poetry*

Aside from *Ms. A* (Chapter 19), the “Proemio Series” (CA 117 and 119, c. 1490; R. 11, 12, 9, 21, and 10; see N. 1) also develops the polemical attack on orators. A few fragmentary, one-line references are found in other notes (*Forster III*, fol. 48r, c. 1493; *Madrid Codex I*, fol. 87b, c. 1498; *Ms. K*, fol. 110 [30v], c. 1506–1508. These notes are merely passing remarks, hardly arguments for the supremacy of painting over the other arts as Pedretti indicates [1977, 1: 76 ff].

There are two comparisons of painting and poetry in late anatomical writings, W19101 (*Anat. Ms. C. III*, fol. 7r), c. 1510–1512, and W19071 (*Anat. Ms. C. II*, fol. 1r), c. 1513. W19101 echoes themes from Chapter 19. The central point of both passages is that words cannot rival the succinct configuration of a drawing. Although Pedretti has also included these passages in the “Paragone,” they are only parenthetical remarks in an illustrated treatise on anatomy that suggest how Leonardo appreciated stereometric methods of anatomical illustration.

4. *On the Proportionality of the Special Senses*

The contrast between instantaneous perception and temporal duration developed primarily out of Leonardo’s studies of the dilation of the pupil, beginning around 1495: for example, *Forster II.I*, folio 158v, R. 36, c. 1495, with reference to the time it takes the eye to adjust to light having deceived him in painting. CA 203 r–a, R. 39, c. 1489–1490, is an early indication of these interests. Leonardo repeatedly compares the percussion of sound and light, in *Ms. A* (folios 102v, 103r, and many pages on percussion of waves, moving objects, etc. at the beginning of the manuscript) and even earlier (*Codex Trivulziano*, fol. 6r, R. 1202, c. 1487–1490, where the movement of the lover to his beloved is compared to objects of the senses); until the end of his life, (CA 382 v–a, c. 1510–1515, where the temporality of music is compared to “decrepitude and death,” terms that are related to Chapter 27).

In *Madrid Codex II* (see especially folios 62v–65r, c. 1503–1505), passages on the movement of wheels, waves, and the “corporeal air” of pyramids follow in successive notes, along with studies of the disform triangulation of pyramids. Folio 70v on the slow contraction of the pupil is related to the discussion of pupil dilation: see CNs 3–6, and Pedretti, 1964, 185–86, citing *Ms. L*, fol. 41v, c. 1502, and McMahon n. 195, c. 1505–1510. The *Codex Hammer*, c. 1506–1509, especially folios 28r, 29r, 33r, compares the rates of speed in various types of percussion. There are related fragments in

Codex Atlanticus (CA 373 r-b/v-a; CA 130 v-b; CA 375 r-c; CA 251 r-a), but a systematic survey of passages on the comparison of the senses is yet to be conducted.

5. *Passages Concerning Music*

A summary of Leonardo's writings on music is given by Pedretti, 1977, Commentary to R. 1129–1130C. One of Leonardo's earliest references to music occurs in a comparison of the senses, on W. 19037v (*Anat. Ms. B*, fol. 20v, R. 797), c. 1489, a plan for a treatise on anatomy. Other early notes on music are observations on the motion of sound, such as statements on the reverberations of an echo in *Ms. C*, c. 1490, and *Ms. A*, c. 1490–1492. Leonardo's only polemical judgment of music to survive in an original manuscript is a single statement on CA 382 v-a, c. 1513–1515 (R. 1130C).

Pedretti (1964, 178) dates all the passages on music in the *Parte Prima* around 1492, but the internal evidence is far from conclusive. Chapter 29 in particular is reminiscent of studies of acoustics related to CA 360 r-a, c. 1504 (see further discussion in CN 29).

6. *A Note about Leonardo's Polemics on Sculpture*

Leonardo's comparisons of painting and sculpture in terms of imitated *rilievo* are cited in Section 2 of Appendix 1. The polemics from *Ms. A* and *Libro A* are discussed in CNs 38 and 41 and related investigations of light and shadow in the late period are discussed in CNs 42, 44, and 45.

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PHOTOGRAPHIC ACKNOWLEDGEMENTS

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INDEX

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INDEX

page numbers in **boldface** refer to the Parte Prima text
 page numbers in *italic* refer to illustrations

- abbachi* (handbooks of geometry), 57
 n. 74, 371
- Accademia del Disegno, 19–20, 124–128
- Accademia Fiorentina, 126
- accidental properties, 77, 297, 392, 351–352, **232–233**, **233 n. 107**; *accidentale arte*, **266–267**; mental accidents, **208–209**, **214–215**; natural accidents, **278–279**; the painter's discourses, **261**; the scientific principles of painting, **252–253**; shadows and lights as, **276–277**; of surfaces, **228–229**.
See also Aristotelian categories; Aristotelian predicates; discourse
- Accolti, Pietro, 30, 116, 411
- agon, 9, 51, 56
- Alberti, Leon Battista: architectural treatise, 63, 88, 121, 331; art criticism, 61, 314, 370, 385–386; on artifice, 358; debt to Aristotle, 105; figurative decorum, 100–101, 315, 340, 342–345; function of painting, 304, 335; on *ingegno*, 61–62, 397, 399–402; and Leonardo, 370, 386–387, 397–398; and Leonardo, on figure composition, 340–346, 385; and Leonardo, on perspective, 164; and Leonardo, on proportion, 340; and Leonardo, on the representation of emotions, 407; and Leonardo, on *rilievo*, 401–402, 412–413; and Leonardo, in “trattato sequences,” 414–416, 419–421; and Leonardo, on *varietà*, 22, 314; Leonardo's critique of, 386–387; liberal arts, definition of, 63; *de lunulareum quadratura*, 368; on lustre, 105; on magnificence and decorum, 121; on music, 346; on optics, 112–113, 311; painting, definition of, 65, 298; Piero della Francesca and, 87; *della Pittura/De pictura*, 294, 329, 340, 371; power of painting, 320; Quintilian, debt to, 342, 353; scientific experiments, 49; sources, 343, 386, 395; on vision, 311, 405; and Vitruvius, 33, 369; writing style, 385
- Albertus Magnus, 301
- Alexander VII, Pope, 160
- Alhazen, 93, 95, 291, 303, 348, 356; on beauty, 320, 325, 362–363; on *intuitio*, 348; Leonardo's knowledge of, 77, 92, 105–108; and Nicole Oresme, 338–339; on perspective, 312; sources, 106, 108, 321; on vision, 310, 313, 394, 409
- allegory, 323–324; of body as a prison, **229–230**, **239–241**, 350–351; humanist debates over the value of figurative language, 67–72; of nature, 294, 339, 384; and painting, 45–51; sixteenth-century personifications of the arts, 143–144
- altercatio*, 33, 37
- Ambrosiana Library, Milan, 29
- amplificatio*, 294
- Antiquarie Prospetive Romane*, 35–36
- Apelles, *Calumny*, 71–72, **212–213**, **216–217**, 345
- apprehensiva*, 301
- Archimedes, 368
- architecture: education of artists in, 83; and music, 87; Pacioli on, 83–85
- Arconati, Count Galeazzo, 29, 31
- Aretino, Pietro, 132, 136
- argumentation, rhetorical: Boethius on, 355; Boethius and Leonardo, 355–356, 381; Aristotle on, 355.

- See also humanism; Valla, Giorgio;
Valla, Lorenzo
- aria*, 320, 397
- Aristotelian categories, 338; in Leonardo's writings, 216–217, 329–330; Varchi's use of, 131
- Aristotelian predicates, 378; 393–394; Leonardo's use of, 164, 320, 329, 338, 341, 345, 393. See also Aristotelian categories; discourse
- Aristotle: Alberti's knowledge of, 412–413; *De anima*, 75, 87, 107, 296, 361; on apparent color, 104–105; art, definition of, 143; on artifice, 375–376; *De caelo*, 359; classification of knowledge, 290; on color, 32, 97, 104–105; commentaries on, 134; on composition, 366; definition of art, 143; distinction between art and experience, 147–148; “double procedure,” 79, 133; on efficient cause, 139; on the *forma agens*, 145–146; function of the artist, 292; on harmony, 349, 365; on images, 332; on the intellect, 73; interpreted by Gianfrancesco Pico della Mirandola, 327; interpreted by Hugh of St. Victor, 65; interpreted by Thomas Aquinas, 65; and Leonardo, on science, 305, 337–338; and Leonardo's use of Aristotelian predicates, 164, 320, 329, 338, 341, 345, 393; Leonardo's knowledge of, 88–91, 164; on magnificence, 120–122; *Metaphysics*, 67, 148, 335, 354; *Meteorologica*, 105; on nature and art, 137, 137–139, 390; *Nicomachean Ethics*, 121; *De partibus animalium*, 366, 373, 375, 381; *Physics*, 307, 314; *Poetics*, 20, 322, 364; on poetry, 76; *Posterior Analytics*, 71, 302; on predicates, 329, 338, 341, 345, 393; on the productive arts, 73, 82, 137–143; on pupil dilation, 347; on recollection, 78; on rhetorical argumentation, 355; on the senses, 108, 295–296; *De sensu et sensato*, 97, 296, 313, 321, 361; on substance, 305; *Topics*, 71, 378
- ars rithmica*, 353
- art academies: history of, 127; training of artists, 125–126, 412
- art criticism, 32, 57, 59; ancient, 33–35; in Florentine debates over poetry, 71–72; by Leonardo's contemporaries, 326–332; Leonardo's development of, 98–114; Leonardo's historical contribution, 114–117; and literary criticism, 317–319, 323–325; Leonardo's sources in scientific literature, 96–114, 320–323, 325; in the midsixteenth century, 128–137; oral tradition of, 51–60; overview of Leonardo's arguments 92–94, 385–392; Renaissance, 35–36, 61–62
- art: Daniele Barbaro on, 146; defined by Aristotle, 143; defined by Hugh of St. Victor, 292; Martino Bassi on, 153–154; paradigms of, 129–137; patronage of, 36, 41, 119–120, 146, 148; sixteenth-century audiences, 51, 55, 59; sixteenth-century definition of the term, 6; sixteenth-century view of, 6–8; and studio procedures, 130; training of artists, 25, 125–126, 155. See also *techné*; method; artistic procedures
- arte*: see art
- artifice, 14; Alberti on, 51, 304; in comparisons of painting and sculpture, 383, 406–407; conflicts between scientific and poetic pictorial embellishment, 132–137; fifteenth-century debates, 68–72; humanist views of, 121–123, 328–329; judgment of, 364–365; Leonardo on, 93, 130–135, 370–376; natural and artificial, 397; nobility of, 375; in painting, 320; value of, 68–72, 358. See also Leonardo da Vinci; liberality; painting; rhetoric
- artist: Renaissance definition of, 119–120; education of, 125–128; status of, 119–128
- artistic competition: see rivalry of artists
- artistic procedures, 28, 49–50; ancient, 389–390; Leonardo on, 45, 49, 97–99, 393, 398–399, 408; Leonardo's literary sources, 386–388; as metaphors for mental discourse,

- 45–48, 144–148; and theory, 128, 130–136, 153–154
- art, judgment of: *see* judgment of art
- arts, liberal: Alberti defines painting as, 123; conflicts between Scholastic and humanist art collectors, 51–57; and humanist classifications, 64–68, 129–131; and Leonardo, 48; and liberality of a ruler, 36, 125; and the organization of the *Parte Prima*, 165; painting and music compared, 244–247; painting defined as, 120–125, 236–239; representations of, 35–36, 143–144. *See also* humanism; classification of the sciences; arts, status of
- arts, mechanical: *see* mechanical arts
- arts, status of: and artistic procedures, 132–137; early humanists on the status of painting, 63–67, 131; as a form of knowledge, 154–155; status of the visual arts, 115, 118–119; theological distinctions, 138–143. *See also* arts, liberal; classification of the sciences; humanism; Leonardo da Vinci; mechanical arts; painting; rivalry of the arts
- asperitas*, 345
- astronomy: and *disegno*, 403; Leonardo's knowledge of shadow projection, 405; and painting, 337, 352
- Augustine, saint: on artifice, 386; *De civitate dei*, 327–328; Leonardo's knowledge of, 115–116, 297, 305, 325, 358; on the nobility of nature, 381; on sight, 328, 350–351; and Thomas Aquinas, 354
- Averroes, 322
- Avicenna, 134, 296, 311–313, 336, 377; theory of vision, 75
- Bacon, Roger, 296, 311; on beauty, 362–363; Leonardo's knowledge of, 291, 312, 390, 403; classification of knowledge, 290; on vision, 310–311
- Barbari, Jacopo de', 86–87, 294, 371
- Barbaro, Daniele, 89, 153, 378; defines "arte," 146–148
- Barberini, Cardinal Francesco, 31
- Barocchi, Paola, 160
- Barocchi, Federico, xv, 114
- Bassi, Martino: Annunciation relief, 149, 150, 152; definition of art, 152–153; *Disparei in materia d'architettura de prospettiva*, 148–149; on *discorso*, 153–154
- Baumgarten, Alexander, 6
- Baxandall, Michael, 385
- beauty: apprehension of, 297; Alhazen on, 339; Roger Bacon on, 362–363; of the created world, 327–329; definitions of, 321, 346; Scholastic notions of, 324–326. *See also* *bellezza*; judgment of beauty; Leonardo da Vinci; proportionality
- bellezza*, 106–110, 112–114, 154, 391
- Bellincioni, Bernardino, 36, 42, 68, 90
- Bellini, Jacopo, 317
- Bellori, Giovanni Battista, 116
- Bernardino da Siena, 68
- Bertani, Giovanni Battista, 149
- Bertoldo, Giovanni da: *Battle Relief*, 51, 54
- Boccaccio: *Amoroso visione*, 336; *Filocolo*, 339
- Boethius, 323, 363, 371; *Consolation of Philosophy*, 144, 317, 351; *De musica*, 346; *Institutio musica*, 362; on rhetorical argumentation, 353–355; *De topicis*, 381; *De Trinitate*, 75
- Bologna, Giovanni da: *Rape of the Sabine*, 21, 22
- Bonaventure, saint, 141, 297, 306; and Leonardo, 139
- Borghini, Raffaello, 20
- Borghini, Vincenzo: comparisons of the arts, 17, 130–131; on imitation, 304; and Michelangelo's funeral, 126; on the organization of knowledge, 128–132, 138
- Borromeo, Carlo, 148; *Instructionum fabricae ecclesiasticae*, 152
- Borromeo, Federico, 29, 31; *De pictura sacra*, 118; *Musaeum*, 60, 118; and science 119
- Borzelli, Agnolo, 290
- Botticelli, Sandro: *Calumny of Apelles*, 70, 71–72
- Bracciolini, Poggio, 356
- Bradwardine, Thomas, 364
- Bramante, Donato, 43

- Brandt, Kathleen Weil-Garris, xv
 brevità, 202–203, 222–225, 323
 Brizio, Anna Maria, 16, 161, 289, 383, 413
 Brunelleschi, Filippo, 49
 Bruni, Leonardo, 292
 Buriden, Jean, 351, 364
 Burleigh, Walter, 90, 364
- Cahn, Walter, 50
 Callistratus, 34, 56
 Calvi, Gerolamo, 161
 Capella, Martianus, 298
 Capellanus, Andreas, 328; *De amore libri tres*, 38
 Cardano, Gerolamo, 26, 116
 Carlo Urbino, 27, 162
 Carracci Academy, 118
 Castiglione, Baldassare, 294, 337; *Il libro del Cortegiano*, 17–18, 40, 123–124, 166, 336, 357, 388, 411; on judgment, 326
 Cavalieri, Tommaso, 11
 Cellini, Benvenuto, 17–18, 26, 138, 144, 163; *Discorso dell'architettura*, 18
 Cennini, Cennino, 63, 293, 334–335, 372, 390; *Il Libro dell'arte*, 398; as a source of Leonardo's views, 93
certamen, 37
 certitude, 178–179; certification of the senses, 192–193; in Leonardo's definition of painting, 95, 250–255; in painting, 186–187; and sensitive judgment, 310; and sight, 312–313; and theory of vision, 291; Thomas Aquinas on, 65–66
chiarezza, 106, 110, 152
chiaro e scuro, xv, 9–10, 50, 77, 96, 292, 391, 395; the difference between painting and sculpture in terms of, 274–275, 280–283; as a discourse, 184–185, 268–271; Leonardo defines as a science, 30, 303–304, 184–185, 264–265, 280–281; how nature aids the sculptor with, 274–279; a science concerned with continuous quantities, 246–247; a science concerned with color, 244–245
 Cicero: Alberti's knowledge of, 61, 343, 353, 386; comparisons of the arts, 319; on harmony, 324; on ideal imitation, 33; influence of, 35; Leonardo's knowledge of, 293; on the nobility of nature, 381; *De oratore*, 62; on ornamentation, 385–386; Petrarch's knowledge of, 328; and Plato, 351; on the *sensus communis*, 292; on sight, 350; on style, 364, 395–396
 Cigoli, Lodovico, 29–30, 31, 116
 classification of the sciences, 14, 32; and contingent knowledge, 89–90; Dolce on, 136–137; Ficino on, 71; Galen on, 377; Hugh of St. Victor on, 290; the humanist organization of the *Parte Prima*, 163–166; by humanists, 330–331; humanist-Scholastic conflict, 64–68, 129–130; Leonardo's knowledge of Scholasticism, 141; medieval, 298; new productive sciences, 64; Poliziano on, 69–71; the productive arts, 349; and the status of painting, 63–67; Thomas Aquinas on, 65–66; Giorgio Valla on, 64, 290; Varchi on, 129–132. *See also* arts, status of; Leonardo da Vinci; painting at definitions of; science
Codex Arundel: *see* Leonardo da Vinci at writings
Codex Atlanticus: *see* Leonardo da Vinci at writings
Codex Huygens, 27
Codex Magliabecchiano, 42
Codex Sforza: *see* Leonardo da Vinci at writings
Codex Trivulzianus: *see* Leonardo da Vinci at writings
Codex Vaticanus Urbinas 1270, 59, 80; history of, 3–5, 16–19, 160–162; compilers of, 16, 161–166, 396; dating, 3–4. *See also* Melzi
cogitativa, 354
 color, 96–110, 129–137; ancient literature, 98; Aristotelian tradition of, 97–98; compared with sound, 313; Leonardo on lustre, 101–105; Paolo Pino on, 135–136; reflected color, 96–110, 113–114, 320; Renaissance discussions of, xiv, 97–99, 114–119, 412; rhe-

- torical concept of, 132; tonal composition, 132–133; Venetian *colore*, 132, 135–137. *See also* *bellezza*; Leonardo da Vinci; light; lustre; optics
- colore*: *see* color
- colors of rhetoric, 132, 322
- commensurability, 362; Leonardo's interest in, 85–87
- common sensibles, 394
- comparatio*, 294, 315, 329
- comparison of the arts: by Alberti, 61; and artistic judgment, 24; by Borromeo, 60; dating of Leonardo's arguments, 315–316; and defenses of poetic allegory, 72; Francesco di Giorgio Martini and Leonardo on, 87–88, history of, 20–24, 62; history of the literary forms, 32–62, 92–93; Leonardo's contribution to the history of, 4–8, 17–20, 41–42; Leonardo's oral sources, 41; overview of Leonardo's arguments, 315–332, 341–342, 383–396; substantive sources, 62–91; techniques of literary criticism, 34. *See also* painting; Leonardo da Vinci; rivalry of the arts
- comparisons of the senses: in medieval poetic contests, 39; history of the textual sources, 24; and art, 313; and the definition of painting, 312; by Leonardo, 295–296; and harmony, 361; sight and hearing, 202–203, 208–211, 214–221, 238–241, 284–287; judgment of art in terms of, 248–249; all the senses, 192–193, 222–223, 228–229, 244–245
- competitions of the arts: *see* rivalry of artists
- compositio*, 315, 329, 345.
- composition: figuration in painting, music, and poetry compared, 248–249; musical theories of, 322. *See also* Alberti
- concento*, 44, 325, 344, 220–221, 216–217, 217 n. 81
- Condivi, Ascanio, 10, 143, 144
- conflictus*, 37
- continuous and discontinuous quantities, 369, 379; defined by Boethius, 63 n. 89
- contrasti*, 39, 93, 317, 326, 337, 344, 351
- convenienza*, 342, 344–345
- copia*, 370, 412
- copies, 297, 401; Scholastic concept of, 305; in Federico Borromeo's Museum, 60; nature of, 244–245; worth of, 186–189
- corpo bianco*, 320
- corpo ombroso*, 178–179, 252–253, 301
- "Court of Love," 40
- Curtius, Ernst, 319
- Danielle, Bernardino, 133
- Dante, Alighieri, 296, 302, 319, 347; *Il Convivio*, 75–76, 310, 334, 339; *Inferno*, 314; *Vita Nuova*, 339; on the physiology of vision, 75–76, 302
- Danti, Ignazio, 25, 30
- Danti, Vincenzo, 304, 376
- De coloribus*, 400
- Decembrio, Angelo, 61, 317–318; *De politia litteraria*, 357–358
- decorum, 62, 146; and patronage, 119–125
- degree (*gradus*): Leonardo's concept of, 363–364. *See also* proportionality
- Delos, problem of, 86
- Demetrius of Phaleron, 33
- Democritus, on color, 98
- demonstration: Aristotelian, 302; art considered as, 48–50, 323; Galen on, 380; painting defined as, 202–203, 210–211, 218–221, 256–257, 262–263, 272–275, 286–287; in poetry, 294
- Dempsey, Charles, 25
- descriptio*, 45, 47–48, 294, 323, 329
- deus artifex*, 73, 392
- deus creator*, 306
- deus pictor*, 392
- dianoia*, 78
- differentia*, 355–356, 375, 381
- difficultà*, 388; associated with pictorial perspective, 13; and perspective, in painting and sculpture, 244–245; Pino on, 135; and the sculptor's art, 258–261, 268–271
- Dio Chrysostom, 92–93, 318, 343, 391, 395
- Dionisotti, Carlo, 90
- Dionysius of Halicarnassus, 33–34

- discorso*, 153, 302, 396, 402; Dante on, 76–77. *See also* discourse
- discourse: Aristotle on, 78, 176–177; artistic procedures, 153–154; *chiaro e scuro* as a science requiring, 268–271; Dante on, 75–76, 302; distinct from frenzy (*furor poeticus*), 204–205; distinct from manual operations, 250–255; Doni on, 137–138; history of the concept, 76–78; and imagination, 144–146; metaphor for artistic procedures, 45–48; and method, 394; oral tradition of art appreciation, 51–60; and ornament, 329–330; painter transmutes himself in the mind of nature, 198–199, 272–273, 333–334; in painting and sculpture, 256–257, 260–261, 262–265, 274–279; and the physiology of vision, 75–76, 302; Plato on, 78; Scholastic views on, 326–327; synonymous with *ingegno*, 268–269; ten discourses of the painter, 252–253, 260–261; Thomas Aquinas on, 75; used to deal with the accidents of nature, 266–267. *See also* accidental properties; *ingegno*
- discrezione*, 93, 315, 320, 340, 341, 345, 348; and Aristotle's predicates, 320–325; and *ingegno*, 340–341; in painting, 214–217. *See also* painting, landscape; perspective, aerial and color
- disegno*, 83, 86, 88, 93, 96, 127–133, 137–138, 141, 143–145, 292, 303, 306, 344, 372, 387–390, 394, 397, 401, 403, 407; at the Accademia del Disegno, 127–128; Francesco di Giorgio on, 88–89; low relief as, 274–275; and mechanical science, 252–253; and optics, 303; as part of perspective, 184–185; as a principle of all the arts and sciences, 226–227; and the religious function of images, 138–143; and *rilievo*, 387–388, 291–292; Vasari on, 138–139
- Divine Craftsman, 334; Augustine on, 327–328
- divine harmony: and commensurability, 309; *see also* proportionality
- Dolce, Lodovico, 11, 17, 21, 62, 134–138
- Donatello, 149, 399
- Doni, Antonfrancesco, 10, 13–14, 17, 129, 144; *Il Disegno*, 10, 134–138, 144, 149
- Doni, Giovanni Battista, 353
- “double procedure”: *see* method, Aristotelian
- dubbi*, 38–39, 60, 336
- Duhem, Pierre, 90, 338, 351
- eclogues, 59
- eikasia*, 78
- ekphrasis*, 34, 72
- elocutio*, 135, 147, 328, 333, 352, 387; eloquence and truth, 335; humanist ideal of, 292–293. *See also* artifice; colors of rhetoric; humanism; rhetoric
- enargeia*, 47, 323–324, 342
- encomium, 33
- equiparantia/equiparanza*, 363, 368
- esempio*, 229
- Euclid, 117, 164, 291, 338, 404; Leonardo's study of, 298; *Optics*, 25, 149
- evidentia*, 47
- “exemplary forms,” 138–139
- exemplum: a method of proof, 71; and the function of art, 153–154
- experience, 178–179; and art, according to Daniele Barbaro, 146–148; a component of science, 250–255; and images, 152–154, 300; Leonardo on, 110–111, 292; and sensitive judgment, 350, 260–261
- experientia*, 378
- eye, function of: anatomy, 75–76; defined by Galen, 82, 148; Leonardo on, 349–352. *See also* Galen; judgment of sense; optics; vision
- facetie*, 318
- “fallacies” of vision, 106–107
- fantasia*, 413; called *imaginativa*, 200–201; Cennini on, 63, 293, 397–398; and *disegno*, 145–146; function of, 76, 145, 153, 333–334; and invention, 293, 333–334, 387–388, 397–398; Leonardo on

- the sculptor's powers of, 390; of painter and poet, 212–215
- Fazio, Bartolommeo, 21, 61
- Federigo Montefeltro, Duke of Urbino, 51, 57
- Ficino, Marsilio, 71
- fiction: and emotion, 324; in words and paintings, 413; Macrobius's classification of, 302. *See also* Leonardo da Vinci; poetry
- figura*, 99, 330
- figure from all sides: in sculpture, 384; Euclidean basis for, 308. *See also* painting; argumentation, rhetorical
- Filarete, 63, 114, 163, 387
- Flemish art: Leonardo's debt to, 97
- Florio, John, 14
- Forlì, Jacopo da, 373
- forma*, 329–330
- Francesco di Giorgio: *see* Martini, Francesco
- “functions of vision,” 77. *See also* Aristotelian predicates; discourse; Leonardo da Vinci
- furor poeticus*, 354
- Gaffurio, Franchino, 87, 356, 363; on polyphonic harmony, 43–44
- Galen, 79, 341, 365, 394; *Ars parva*, 80, 376; classification of the sciences, 377; commentaries on, 134; debt to Aristotle, 82–83; on demonstration, 380; in discussions of art, 375–380; on the eye, 75, 148; on humors, 340; influence of, 117; Leonardo's knowledge of, 80–81, 373–375; on method, 79, 115; *Method of Healing*, 380; on nature, 372; on the productive arts, 366; rhetoric, invective formulas, 81–82; on the temperaments, 372–373; *De usu partium*, 82–83, 148
- Galileo, Galilei, 29–30, 411
- Gauricus, Pomponius, 293; *De sculptura*, 385–386
- Geofrei of Vinsauf, 324
- George of Trebizond, 385
- Ghiberti, Lorenzo, 123, 296, 353; and Alberti, 114; and Alhazen, 339; definition of art, 63, 297; on *disegno*, 138, 388; on *misura*, 322, 353; on reflected color, 105; on *rilievo*, 388
- Ghirlandaio, Domenico, 123
- Giorgione, 49
- Giovanni, Bertoldo di, 51, 318
- Giovio, Paolo, 18–19, 317
- Gombrich, E.H., 315, 319
- Gonzaga, Duke Gianfrancesco, 123
- gradus* (degree), 364
- gramma*, 293
- graphaeis*, 293
- gratia/grazia*, 113, 345, 391, 397; and harmonic proportionality, 242–243, 248–249
- Grocheo, Johannes, 353
- Grosseteste, Robert, 311, 363
- Guarino of Verona, 385
- Gundissalinus, Dominicus, 290
- Hagstrum, Jean, 6
- harmoge*, 345
- harmonia*, 345
- harmonic proportionality; as embellishment, 365; and *harmonia*, 345; and music, 371–372; in painting, 216–219; 220–225, 234–237, 240–243. *See also* music; proportionality
- harmony: and apparent color, xiv–xv; delight in, 324–325; divine, Leonardo's conception of, 83–87; and geometry, 44; and the internal senses, 347–348; polyphonic, 43–44; types of, 348–349. *See also* harmonic proportionality; music; Pacioli; proportionality
- Hecht, Peter, 24
- Heydenreich, Ludwig, 163, 165
- Hollanda, Francisco de, 17
- Horace, 334, 386; *Ars poetica*, 319
- Hugh of St. Victor, 298, 320, 332, 349, 359, 375; debt to Aristotle, 65; definition of art, 292; *Didacalicon*, 73, 290; Leonardo's debt to, 139, 298, 331–332, 349, 359, 375; on the classification of the sciences, 290; on the mechanical arts, 64; on nature, 355; scientific spirit of, 324
- humanism, 30, 47; art collectors, 51–61; classification of knowledge, 64–68, 129–130, 292–294, 330–

- 331; in Florence, 68–72; defense of poetry, 66, 68–72; and the productive sciences, 129–131, 290; rhetorical model of composition, 134; and the visual arts, 19–20, 25, 129–137. *See also* Alberti; Castiglione; classification of the sciences; *Parte Prima*; Poliziano; rhetoric; Sforza court; Valla, Giorgio; Valla, Lorenzo
- Iconoclasm, 332
- Images, 292; compared with *exemplum*, 71; and discourse, 7; in the early seventeenth century, 118–119, 154–155; and Iconoclasm, 332; imitation of nature, 355–356; landscape motifs, 319; Leonardo's terminology of, 403–404; in paintings, 332–334; perception of illusions, 405–406; and mathematical study, 75–78; religious function of, 138–143; *simulacrum* (*simulacro*), 180–181, 188–189, 198–199, 242–243, 272–273; *similitude*, 178–179, 272–273; *species*, 198–199; value of, 347. *See also* optics; painting; poetry
- imaginatio*, 296, 322, 323
- imagination: and color, 107–110; Counter Reformation attitudes, 117; the fictions of painting, 240–241; function of, 75–78, 96, 153–154, 178–181; and the internal senses, 300–301; and knowledge of God, 236–237; and license, 336; and literary artifice, 67–72; powers of, 334; products of, 200–203, 208–215, 218–219, 226–227, 250–251, 264–267; and pupil dilation, 107–110; stylistic, criteria for judging, 294. *See also* discourse; *discorso*; *fantasia*; *ingegno*
- imaginatione*, 294, 301
- imaginativa*, 296, 370, 390, 397
- imitation, 304; ancient theories of stylistic imitation, 33–34; of art and nature, 50–51; in devotional painting, 190–191; during the Counter Reformation, 117; Gianfrancesco Pico della Mirandola on, 326; Leonardo on pictorial composition, 110–114; painting compared to nature, 194–195, 216–217, 224–225, 232–235, 314–315; religious, 232–233, 236–237, 246–247. *See also* painting; sculpture
- imprensiva/impresiva*, 296, 301–302, 397
- ingegno* (*ingenium*), 106, 393, 407; Alberti on, 61–62, 386–388, 399–402; Alberti as Leonardo's source, 61–62, 386–388; and allegory, 294; and ancient technology, 331; and artifice, 24, 93, 340; and color, 100; compared to a mirror, 76, 333–334; Dante on, 76–77, 76 n. 126; definition of, 293; and devotional painting, 230–231; and discourse, 402; and *discrezzioni*, 340; *fantasia*, synonymous with, 212–213; Horace on, 386; Hugh of St. Victor on, 73; and imagination, 333–334, 402; and invention, 73, 93, 100, 106, 323, 333–334, 340, 402, 407; and judgment, 106, 393; Leonardo's sources, 61–62, 76, 139–143, 323, 372, 386–388; and license, 328–329; medieval sources of, 76, 139–143, 294, 323, 370, 372; and the mechanical sciences, 73–74, 212–213; and mental discourse, 260–261; of painter and poet compared, 212–213; of painter and sculptor compared, 244–245, 264–267, 268–269; praised by Alberti, 61–62; science of *chiaro e scuro*, 280–281; and the status of painting, 354; synonymous with *fantasia*, 212–213; Varchi on, 131. *See also* discourse; *fantasia*; judgment of art; Leonardo da Vinci
- intentio*, 354
- internal senses: in art, 315; and artistic license, 118–119; and experience, 252–255; and figuration, 248–249; function of, 214–217; imagination, 198–201; *imaginativa*, 200–201; *imprensiva/impresiva*, 180–181, 198–201, 220–221, 296, 301–302; and *ingegno*, 61–62, 293; and invention, 135, 354, 387; memory, 198–201,

- 218–219; in musical composition, 353–354; and poetry, 135–137; and representation of emotion, 342–343; *senso comune*, 186–187, 198–201, 214–215, 218–219, 220–221; sources of Leonardo's knowledge of, 296–297; visual virtue (*virtù visiva*), 180–181
- invention: compared with poetry, 228–229; the fictions of painters and poets compared, 208–215; and harmonic proportionality, 236–237; labor-saving devices, 270–271; in painting, 202–203. *See also* Alberti; Leonardo da Vinci; painting
- Isidore of Seville, 328
- istoria*, 305; Albertian statements in the “trattato sequences,” 101, 414–423; its components, 214–215; Leonardo and Alberti on, 315, 342–344, 398–399, 412; Leonardo's depictions of, 36; Pino on, 135; words compared with images, 208–215
- John of Damascus, 332, 354
- John of Garland, 322, 323
- Jordan, Max, 160
- judgment of art, 294, 314, 356–358, 391, 409; in carving *rilievo*, 258–259, 276–277; criteria, 129–137, 152, 397; contents the mind, 236–237; Dolce on, 136–137; and *ingegno* 24; and magnificence, 120–125; and oral discourse, 56–61; painting deceives the eye, 214–215, 280–281; in viewing *rilievo*, 264–265. *See also* judgment of beauty; judgment of sense
- judgment of beauty, 325–327; Castiglione on, 326; demonstrability, 291; by the ear, 313; by the eye, 297, 309, 389; fallacies of vision, 405–406, 409; and invention, 340–341; and invention in music, 368–369; procedures for, 354; by sense, 321, 354, 364. *See also* images; proportionality; judgment of art; judgment of beauty
- judgment of sense, 230–233, 234–237, 248–249; sight and hearing compared, 214–217; a source of delight, 218–221, 220–225; a source of stupefaction, 218–219; visual judgment, 192–193, 272–273, 260–261
- Kant, Immanuel, 6–7
- Kemp, Martin, 44, 313, 318, 413; on the Deluge drawings, 319; on Leonardo's multiple view figures, 384; on Leonardo's perspective, 99, 405; as translator, 169
- Ketham, Johannes de: *Fasciculus medicine*, 296, 300
- Kilwardby, Robert, 290
- Kristeller, Paul, 6
- Landino, Christoforo, 14, 90, 301; *Disputationes Camaldulenses*, 69
- Le Goff, Jacques, 91 n. 166
- Leonardo da Vinci: Academy of, 125; and Alberti *see* Alberti. And Alhazen, on beauty, 77, 320; anatomy, study of, 379; on Aristotelian method, 89–90; *see also* method, Aristotelian. Art, language derived from optics, 106–110; on artifice, 67, 93, 115, 135, 370–376; *see also* artifice. On artistic license, 61–62; artistic predecessors, 63; artistic techniques, 45, 49, 97, 99; astronomy, 352; booklists, 90; and Cennini, 398; *chiaro e scuro*: *see* *chiaro e scuro*. Chronology of his paintings, 96–99; classification of knowledge, 298; color, xiv, 97–99, 101, 104, 108, 110, 112, 135; commensurability, interest in, 85–87; comparison of medicine and architecture, 376–377; on concord, 44; critical values on art: *see* art criticism. Dating of his manuscripts, 289; definition of mathematical science, 86; definition of painting, 95, 111, 289–302; definition of perspective, 80, 111, 291–292; other definitions, 143; degree, concept of, 363–364; developmental aspects of his writings, 94–100, 383; discourse: *see* discourse. On *disegno*, 135, 145,

292; dismissal of *furor poeticus*, 337; "double procedure," 79, 80; as an engineer, 331; and Euclid, 298, 306, 308; and Francesco di Giorgio Martini, 87–89; on the function of the eye, 82, 107, 108, 109; on *furor poeticus*, 337; Galen, knowledge of, 80–83, 365, 372–380, 394; and Guaricus, Pomponius, 385–386; geometric studies, 85, 115, 298; on harmonic proportionality, 43, 76, 216–225, 234–237, 240–243, 365, 371–372; historical contribution, 4–8, 17–21, 24–31, 41–42, 119; history of his manuscripts, 28–31; humanist theories of rhetorical invention, 6; imagination, 75–76; *ingegno*, 153, 333–334; library, 44, 90, 296; *Libro di Pittura di M. Leonardo da Vinci*, 3; on light, 9–10, 98: *see also* luster (this heading). Literary descriptions, 318–319; literary remains, 4, 16, 28–29, 163; and Lucian's "dream," 393; on luster, 101–104, 111; manuscripts, history of, 28–31; mathematical science, definition of, 85–86; on method: *see* scientific method; technique (this heading). On modeling, 48–49, 83, 86; modernity of his views, 4; on music, 165; as a musician, 42–44; on nobility, 72–73, 75–76, 115; optics, 77, 99, 101, 111–117, 291; optics, language of art derived from, 106–110; and Oresme, 92; overview of his arguments, 92–94, 315–332, 341–342, 383–396; on painting: *see* painting. His paintings compared with vernacular poetry, 44–45; patronage of, 41; paradoxical language, use of, 385, 395–396; perspective, definition of, 80, 111, 291–292; pictorial perspective, 50, 93, 99–100; 114–117, 410; poetry of, 165; on poetry, 65–67; polemics, 41–42, 48; on the productive arts and sciences, 349, 358–359; "Proemio Series," 81–82, 299, 379; on punctiform analysis, 291; on pupil dilation and the imagination,

107–110; on reflected color, xiv, 96–114; representation, problems of, 406–407; rhetorical and scientific color, 132, 133; "rule of three," 299–300; and Savonarola, 68; and Scholasticism, 90, 141; scientific investigations, 115; on scientific method, 79–91; his scientific rationalism, 93; on sculpture, 45, 383–396; on the *senso comune*, 74–76; sources of his arguments, 14–17, 37–39, 41, 45, 88–93, 346, 383, 390–392; successors to, 116–118; technique, 45, 48–49, 97–99, 393, 398–399, 408; and *tenzoni*, 39; terminology, 266, 300, 403–405; theatrical projects, 36; on tonal structure, 96–97; "trattato sequences," 99–105, 110, 414–423; *Trattato*: *see* *Trattato*. And Lorenzo Valla, 64; on vision, 62, 107–110, 349–350; wit of, 317. *See also* individual arguments indexed under topic; *Parte Prima*; *Trattato*

works of art:

Battle of Anghiari, 50, 53; *Cecilia Galleriani*, 45, 46; Deluge drawings, 319; drawing of four grotesque heads (W12495), 344; *John the Baptist*, 97; *Last Supper*, xiv, 96–97; *Mona Lisa*, xiv, 45; Francesco Sforza monument, 35, 384, 396; sheet of picture writing, 360; storm breaking over a valley, 288; studies for the lantern tower of Milan Cathedral, 84, 85; studies of horses, lions, and dragons, 316; two views of the skull, 74, 75; *Virgin and Child with St. Anne*, 96, 97, 140, 141

writings:

Additional surviving notes on the comparison of the arts, 162–163; *Anatomical Ms. Cl*, 379; *Codex Arundel*, 299, 333, 404, 406; *Codex Atlanticus*, 15 n. 36, 80–83, 85–86, 100; CA 117r–b, 81–82; CA 119v–a, 81–82; CA 203r–a, 80; CA 270r–c, 80, 83, 85–86; CA 277v–a, 15 n. 36; *Codex Sforza*, 15, 162;

- Codex Trivulzianus*, 85; *Codex Urbinas*, 95–96, 110, 318, 333, 340, 388, 396, 406; *Libro A*: see *Libro A*. *Madrid Codex II*: see *Madrid Codex II*. *MS. A*: see *MS. A*. *Ms. C*, 29, 100; *Ms. D*, 295, 303, 310–312, 391, 403; *Ms. E*, 108–111, 303, 333, 386, 413; *Ms. F*, 86, 310, 333; *Ms. G*: see *Ms. G*. See also Appendices 1 and 2
- Leonardo's Academy, 125
- Leonello of Ferrara, 318
- Leoni, Pompeo, 28
- Leonico, Niccolò, 90
- Lessing, Gotthold Ephraim, 4, 6–7
- liberality: and magnificence, 120–122, 126–127
- Libro A*: on artistic judgment, 340–341; on color, 112–114, 412–413; correspondences with *Ms. A*, 383; dating of, 15, 29; incorporation into the *Parte Prima*, 383, 406, 411; Pedretti on, 29, 315–317; references to Alberti, 342, 407; *rilievo*, 108; style of writing, 386
- license, artistic, 118–119, 352
- light: Leonardo on quality and quantity of, 98–99. See also *chiaro e scuro*; color; lustre; optics; perspective, pictorial
- Lille, Alain de, 305, 320, 323, 328; *Anticlaudianus*, 384
- Lindberg, David, 115
- line, terminology, 185 n. 15; *dintorni* (contours), 258–261; and *disegno*, 144–146; in Leonardo's theory of pictorial composition, 111–114; *linee* (visual lines), 282–283. See also *termini*
- Lippi, Filippino, 122; Carafa Chapel, 124
- locus amoenus*, 319, 333
- Lomazzo, Gian Paolo, 15, 27, 116, 163, 389; *Trattato dell'arte e la pittura, scoltura et architettura*, 27
- Lombardo, Tullio, 11–13; Pietà, 12
- Lowinsky, Edward, 354, 363
- Lucian, 384, 393
- Lucretius, 331
- ludi geometrici* (mathematical puzzles), 57, 368
- Ludwig, Heinrich, 160–161, 290–291
- lustre, 101–105, 111–113, 303
- Machiavelli, 294
- Macrobius, 302, 324, 347; *Commentary on Cicero's Dream of Scipio*, 351
- Madrid Codex II*: bronze casting, 394; comparisons of the senses, 312; imagination and color, 107–108; light and shade, 371; lustre, 112; definitions of painting, 95, 298–299; perspective and motion, 307–308; pictorial composition, 112–113
- Maffei, Timoteo, 121–123
- magnificence: and liberality, 120–122
- Maiano, Benedetto da, 318
- Mantegna, Andrea, 149, 318
- Manzi, Guglielmo, 8, 10, 160, 289
- manuscript: see *Ms.*
- Marinoni, Augusto, 90
- Martini, Francesco di Giorgio, 43, 304; and Leonardo on Aristotelian method, 88–89
- materia*, 324–325, 329
- mathematical puzzles (*ludi geometrici*), 57, 368
- Matthias, Corvinus, King of Hungary, 41, 234–237, 317–318, 355–356
- Mazenta, Ambrogio, 24, 28, 163
- Mazenta, Guido, 18
- McCabe, James, 309
- McMahon, A.P., 160–161, 169, 289, 306–307
- measure: and judgment, 393. See also *misura*
- mechanical arts: Bonaventure on, 306; distinct from painting, 131; Hugh of St. Victor on, 64–65, 72–73, 290; Leonardo on, 221, 373–378; Pacioli on, 221. See also classification of the sciences; science; sciences, mechanical
- Medici, Cosimo I de', 121–122, 126–128, 130
- Medici, Lorenzo de', 125–127, 326, 356; *Altercazione*, 328
- Meltzoff, Stanley, 71–72
- Melzi, Francesco, 16–18, 28; his collaborators, 161–162
- meraviglia*, 324
- method, Aristotelian, 79–91, 302, 366; Aristotle on art as process, 137 n. 40; Aristotle on design, 366; controversies over, 79, 377; and discourse, 394; Francesco di Giorgio

- Martini on, 88–89; Galen on, 79–83; Leonardo on “double procedure,” 133; Leonardo’s debt to Galen, 373; meaning of *methodus*, 6; Poliziano’s interest in, 71. *See also* classifications of the sciences; rhetorical argumentation
- methodus*, 6, 79 n. 136
- Michelangelo Buonarroti, 10–11, 125, 304, 391; *Battle of Cascina*, 51; *Battle of Lapiths and Centaurs*, 51, 55; Catafalque design, 142, 143; funeral of, 14, 19–20, 26, 126, 144; tomb of Julius II, 143, 144; praise of sculpting, 144, 149; Sistine Chapel ceiling, 98
- Miel, Jan: *Blind man comparing painting and sculpture*, 23, 24
- Milan Cathedral, facade competition, 148–152
- Mirandola, Gianfrancesco Pico della, 297, 326–329, 347
- misura*, 353
- models, 48–49; Leonardo and Pacioli on, 83–86
- Mondino, *Anathomia*, 296, 300
- motion: and invention, 353–354; and painting, 295; and perspective, 307–308; and qualitative change, 338; science of, 190–191
- Ms. A*, xiv, 41, 102, 333; references to Alberti, 101, 315, 340–343, 358, 371, 397, 399–402; reflected color, xiv, 101–103, 112; *corpo ombroso*, 301; *discrezioni*, 320; ekphrastic descriptions, 318; incorporated in the *Parte Prima*, 4, 162, 165–166, 356, 369, 395–396, 406; fantasia, 333–334; *Libro A*, correspondences with, 383; lustre, 103, 112; optics, 111–112; on painting, 393; relief, 406, 411; sculpture, 393; study of human movement, 308–309; theory of vision, 303, 310–311; universality of painting, 365, 370; and workshop tradition, 398
- Mss. C, D, E, and F*: *see* Leonardo da Vinci at writings
- Ms. G*, 299, 303, 413; *fantasia*, 333; on pictorial decorum, 413; pictorial relief, 96, 111–112; science of perspective, 10; style of writing, 386
- Musea*, 56–60; Federico Borromeo’s *Musaeum*, 60; Palazzo Barberini, 57–59
- music, 42–43, 87, 322–323; as an accompaniment to painting, 256–257; and architecture, 87; classification of as a science, 242–243; composition, 322; dating of Leonardo’s writings on, 361; and *ingegno*, 370; judgment of, 368–369; and natural instinct, 323; and perspective, 362–363, 366–367; produces delight, 242–243; proportionality of, 216–217. *See also* proportionality; harmony
- nature: and art, 137–140; and artifice of sculpture, 264–265, 274–279; beauty of, 77, 204–207; contemplation of, 224–229; ornaments of, 133, 216–217; and pictorial embellishment, 214–217; sight praised in terms of, 238–241; works of, 73–75, 186–187, 236–237; works of, compared to painting, 194–195, 208–215, 232–235, 236–237, 240–243, 248–249, 254–255
- Nemore, Jordanus de, 364
- neoplatonism: and the hierarchy of the senses, 24
- Niccoli, Niccolò, 61
- Nicephorus of Gregorius: *Astrolabica*, 405
- Nichomachus of Gervasa, 359
- Nicolas of Cusa, 293
- nobility: Aristotelian conception of, 73–75; and mathematics, 66; of painting, 72–76, 188–189, 305–306; of painting, compared with language, 254–255; of sight, 24, 196–199, 204–205, 208–211, 214–217, 216–219, 226–229, 238–241, 244–245; of the sciences, 66, 236–237; of the senses, 37–38; Thomas Aquinas on, 66, 73–76, 305–306, 335, 346–347
- numerositas*, 324
- obscurità*, 110
- Onians, John, 88–89
- optical metaphors, 32–33

- optical naturalism, 5, 118, 119; and the Counter Reformation, 118–119, 154–155; Federico Borromeo on, 119
- optics, 149; classical tradition of, 112; Leonardo's distinction between formal optics and pictorial perspective, 98; and motion, 307; relation to musical harmony, xiv–xv. *See also* Alhazen; *chiaro e scuro*; perspective, pictorial
- Oresme, Nicole, 93, 297, 321, 338, 339, 351, 394; *De configurationibus qualitatum et motuum*, 346
- ornament: and decorum in patronage, 120–123; artifice in poetry and painting, 72. *See also* perspective, pictorial; artifice; rhetoric; colors of rhetoric
- Ovid, 38, 90, 319, 328; *Metamorphoses*, 319
- Pacioli, Fra Luca, 348, 371; defines painting as a science, 65; *De divina proportione*, 83–85, 308, 361, 367; and Leonardo, 13, 43–44, 294–295, 298–299, 320, 331, 346, 356–359, 362; and Piero della Francesca, 87; as a writer, 86; on polyphonic harmony, 43
- painting, 48–49; on adding and taking away material, 258–261, 268–269; its beauty, 194–197, 210–211, 220–225; Alberti defines as a science, 65; and allegory, 45–51; battlescenes, 50–51, 317, 200–203, 210–211; beauty of, 194–197, 210–211, 220–225; Borghini on, 130–131; classification of, 192–193, 206–207, 228–231, 254–255; communicability of, 184–187; components of, 306; consisting of invention and measure, 228–229; criteria for judging, 134, 210–219, 232–233, 264–267; and cult practices, 188–191; defined as a liberal art, 36, 48, 120–125, 131–132, 236–239, 413; defined as a mechanical art, 304; defined as a science, 63, 65, 80, 92, 95–96, 99, 114–117, 131, 176–179, 184–185, 226–227, 254–255, 272–275, 380–381; defined as an intellectual discipline, 120, 123, 290–291, 337–338; defined as natural philosophy, 132, 295, 307; devotional, 188–191, 210–211, 230–231, 246–247; defined in the *Parte Prima*, 289–312; distinct from mechanical sciences, 210–213, 250–255; Doni on, 149; its endurance, 212–213, 222–223, 240–245, 260–263, 284–285; on the figure seen from all sides, 200–203, 246–249, 258–260, 262–263; first principles of, 176–179, 226–227, 252–255; geometric demonstration of, 180–183; hierarchy of the sciences, 337–338, 290–291; its greater mental discourse, 244–245, 274–279; its harmonic proportionality, 218–219, 234–237, 240–243, 248–249; and imagination, 178–181; imitation in, 185–187, 224–225, 314–315; Leonardo's classification of, 95–96, 163–165, 192–195, 206–207, 210–213, 226–231, 238–241, 250–255, 289–312; Leonardo's concern with the beauty of, 109–114; and literary criticism, 92–93; and magnificence, 123–124; metaphors of, 45–51; nobility of, 72–76, 188–189, 305–306; Paolo Pino on, 135–136; paradoxical illusion of, 24–25, 115, 327–328; and perspective, 244–245, 257–271, 276–283, 361–362; portrait, 206–207, 216–219, 234–235, 242–243, 246–247; produces delight, 232–235; and religious writings, 230–233; representation of emotion in, 340–341; Scholastic definition of, 63, 65; science of, 176–179, 184–185, 226–227, 254–255, 272–275; its simultaneity, 220–225; techniques, 48–49, 97–99, 262–263, 266–267, 270–271; universality of, 5, 67, 154–155, 186–187, 202–203, 208–211, 218–221, 226–227, 244–245, 252–255, 292–293, 370; its utility, 184–

- 187; Varchi on, 130–131, 378; and vernacular poetry, 44–45
- Palazzo Barberini, 57
- Paragone, 3; history of the literary term, 8–14; manuscript sources, 14–17. *See also* painting; rivalry of the arts
- paragone*, 35–36; etymology of, 8–9, 13–14; and the imagination, 153–154; Leonardo's use of the word, 9–10
- Pardo, Mary, 301
- Parte Prima*, 3, 4; compiler of, 195 n. 43, 369–370, 396, 410; dating, 15–16, 289–290, 361; definitions of painting in, 289–312; description of the manuscript, 159; editorial procedures, 166–170; extant passages in Leonardo's notes, 4, 162–163, 407; organization of, 92, 163–166. *See also* painting; specific arguments indexed under topic
- patrons, of artists, 120–127; in conflict with artists, 148–154; Daniele Barbaro's criticism of, 146–148
- Pausanias, 56
- Pecham, John, 311; and Aristotelian method, 80–83; Leonardo's knowledge of, 80–83, 90, 108, 291, 303, 403–404; *Perspectiva communis*, 82, 134, 164, 298–299, 301; *radiosa piramida*, 291
- Pedretti, Carlo, 16–17, 26, 29, 161, 370, 383, 408–413, 452; dating of *Ms. A*, 333; dating of *Ms. E*, 108; dating of the *Parte Prima*, 289, 315, 346, 372, 408, 410–412
- Pelacani, Biagio, 310, 361, 364, 404–405
- perspective, pictorial, 49; accidental (artificial) and natural distinguished, 99, 405, 410–412; aerial and color: 244–245, 272–275; artistic invention, 50–51; chronology of Leonardo's writings on, 100; classified as a liberal art, 64–65; definition of, 80, 111, 191–192, 250–255, 291–292, 361; heightened contrast, 113–114; Leonardo's categories, 99–100; and low relief, 264–265; and music, 366–367; Paolo Pino on, 135; parts of, 184–185, 262–263; principal part of painting, 206–207, 230–231; and the sculptor's *rilievo*, 276–279; source of conflict between patrons and artists, 148–154; superior to sculpture, 244–245, 262–265, 266–267, 268–271, 280–283. *See also* proportionality
- perspicuitas*, 385
- Peruzzi, Baldassare, 149
- Petrarch, 64, 138, 293, 328, 351, 358
- phantasia*, 301, 343
- phantasms*, 153, 350
- Philostratus the Elder, 56, 57, 314, 318
- pictorial harmony: Leonardo's principles of, 96. *See also* Alberti; composition; harmony; proportionality
- Piero della Francesca, 98; debt to Alberti, 114; definition of painting, 63, 362; Francesco di Giorgio's knowledge of, 87; Leonardo's knowledge of, 163, 320, 335; Pacioli's contact with, 361, 367; *De prospettiva pingendi*, 362, 371, 415
- Pino, Paolo, 17, 132, 138; *Dialogo di Pittura*, 62, 135; on painting, 134–136; on poetry, 135
- Pinturricchio: Bufalini Chapel, 122
- Pisanello, 317
- Plato, 324, 328, 349, 358, 389; *Alcibiades*, 337; on color, 98; problem of Delos, 86; on discourse, 78; *Ion*, 323; *Laws*, 359; *Phaedrus*, 326, 337; *Republic*, 78, 351, 359; on sophistry, 116; *Symposium*, 325; *Timaeus*, 293, 323, 350, 351
- Plethon, Georgias, 332, 377
- Pliny the Elder: Alberti's use of, 61, 298, 343, 412; Leonardo's use of, 318–320, 352; on painting as a liberal art, 29
- Pliny the Younger, 56
- Plotinus, 368, 389, 392
- Plutarch, 61, 90, 93, 318, 342–343, 352
- poetic contest literature, 24, 32–39; ancient, 36–37, 51, 56; medieval, 37–39; Leonardo's debt to, 336; use of paradox, 309; between painters, 317–318; Renaissance, 40, 41, 56

- poetry: *dolce stil'nuovo*, 324; classification of, 299; Florentine debates over the status of, 68–72; humanist defenses of, 66–72; humanist-scholastic debate, 64–68; inferior to painting, 226–227, 228–231; at the Milanese court, 42–45; as moral philosophy, 212–213; Paolo Pino on, 135; subordinate to the other sciences, 196–197, 248–251; and theology, 66–72; Thomas Aquinas on, 66. *See also* classification of the sciences; Leonardo da Vinci
- polemics: the lying mental sciences, 250–255; rivalry of painting and sculpture, 6–8. *See also* Galen; Leonardo da Vinci; painting; rhetoric; rivalry of the arts; specific arguments indexed under individual topics
- Poliziano, Angelo, 90, 293, 297, 356, 377; classification of painting, 64; interest in Aristotelian method, 71; *Lamia*, 71; *Panepistemon*, 69, 290, 359
- Pollaiuolo, Antonio, 50, 318, 388; *Battle of the Nudes*, 50, 52
- Pontano, Giovanni del, 61
- Pontormo, Jacopo, 138
- Porta, Guglielmo della, 26
- Poussin, Nicolas, 30
- Pozzo, Cassiano dal, 31
- Prez, Josquin des, 322, 354
- Priscian, 294
- productive sciences: embraced by humanists, 129–131; Leonardo's appreciation of, 358–359. *See also* mechanical arts; arts, liberal; classification of the sciences
- proportionality: and beauty, 321, 338–339, 346; in low relief, 262–265; and music, 43–44, 242–245; Oresme on, 338–339; Pacioli on, 83–85; painting and poetry discussed as a proportion, 178–179; pictorial perspective identified with continuous proportion, 242–247; sculptor's knowledge of measure, 260–261, 268–269; in visual images, 356–357. *See also* Alhazen; harmony; Leonardo da Vinci; painting; perspective, pictorial
- prose romances: Leonardo's debt to, 336–337
- Prudentius, 317
- Ptolemy, 106, 347, 409; *Optica*, 321
- Pulci, Luca, 44
- Pulci, Luigi, 413
- puncto naturale*, 394
- pupil dilation: Aristotle on, 347; imagination and, 107–110. *See also* Leonardo da Vinci; optics
- Puteolano, 14
- Pythagoras, 83, 85
- Quadrivium, 65, 68, 134, 298
- quality, 338, 412. *See also* optics
- Quintilian, 319, 324, 330, 343, 364; Alberti's debt to, 342, 353; on *enargeia*, 47; on ideal imitation, 33; on music, 354
- Raphael, 114, 149
- reflected color: *see* color; optics; Leonardo da Vinci
- representation, nature of, 4–8, 63; and Leonardo's writings, 115–117; and optical naturalism, 154–155
- rhetoric: classical, 33–35; colors of, 132, 322; encomia addressed to artists, 35–36; epideictic, 33–36; Galen's invective formulas, 81–82; humanist theories of argumentation, 5, 67, 164, 330, 355–356; medieval poetic contests, 36–39; methods of discoursing on art, 57–60; oral tradition of, 51; in the Renaissance, 34–36, 51; virtues of style, 11, 32–35, 47 n. 54; visual panegyrics, 126; and the arousal of emotion, 344; brilliant style, 324. *See also* Alberti; Quintilian; argumentation, rhetorical; individual terms of praise and blame
- Richter, Irma, 8, 160, 169, 289
- Richter, Jean Paul, 299
- rilievo*: Alberti on, 400–402, 412–413; *chiaro e scuro*, 303–304; and *disegno*, 388; exercises for the painter, 393; and *ingegno*, 93, 400–402; Leonardo's successors, 115–117; Leonardo's investigation of, 101, 106–114, 291–292, 393, 406;

- Leonardo's precedents, 115–116, 388–392, 400–402; Leonardo's sources, 390–391; lighting in sculpture, **280–281**; low relief, **274–275**, **278–279**; low, medium and high relief compared, **262–265**; Martino Bassi on, 148–152; mental effort, in painting, **284–285**; natural and artificial compared, 411–412; and optics, 106–114; painting and sculpture compared, **258–261**, **266–271**, **274–281**; and the *Parte Prima*, 165; Pliny on, 49 n. 58; Quintilian cites, 47 n. 54; and reflected color, 103; the sculptor's procedures, 408; discussed in the "trattato sequences," 101, 414–423; and tonal composition, 132–134; Vasari and Lomazzo on, xv; discussed in Venetian art criticism, 132–134
- rithmus*, 322
- rivalry of artists, 13, 21–24; Leonardo on, 45
- rivalry of the arts: Martino Bassi on, 149; criteria for judging, 129–137; and improvisatory forms of entertainment, 40–42, 317–318; in Leonardo's time, 32–91; nineteenth-century development of, 7–8; parallels in literary criticism, 20; in the sixteenth-century, 9–14, 17–25, 125–128, 138–139, 143; Benedetto Varchi's questionnaire, 19. *See also* Paragone; individual arguments indexed under topic
- della Robbia family, **262–263**
- Romano, Giulio, 149
- Rosand, David, 25
- Rovere, Francesco Maria della, 160
- rule of proportionality ("rule of three"), **178–179**, 299–300
- Salutati, Coluccio, 292, 328, 358, 364
- San Marco sculpture garden, 125
- Sangallo, Francesco, 144
- Savonarola, Fra Girolamo, *De divisione scientiarum*, 68; on perspective, 65; on poetry, 68–69, 71
- Scholasticism: classification of knowledge, 67; copies, concept of, 305; on discourse, 326–327; Leonardo and, 90, 141; on nobility, 75; painting, definition of, 63, 65. *See also* classification of the sciences; humanism; Thomas Aquinas
- science: distinct from mechanical knowledge, 368; immitability of, **186–189**; and metaphysics, 119; painting as the supreme science, **244–245**; position of painting among, **238–241**; scientific methods, 79, 89; scientific naturalism, 31; in training of artists, 25–26; utility of, **184–187**. *See also* arts, mechanical; classification of the sciences; method, Aristotelian; painting; *scientia/scienza*
- sciences, mechanical: classification of mechanical science, 69, **250–255**, 359; the new productive sciences, 64, 73; painting distinct from mechanical science, **244–245**; sculpture as a mechanical art, **256–257**; writing as a mechanical science, **190–191**. *See also* classification of the sciences; humanism; Scholasticism; Thomas Aquinas
- scientia media*, 81–83, 95, 101, 134, 298, 380
- scientia/scienza*: medieval definition of, 65 n. 96. *See also* Leonardo da Vinci; painting at defined as a science
- scorci*, 50
- sculpture: on adding and taking away material, **276–279**, **282–283**; bronze casting, **282–285**; its durability, **266–267**, **268–269**; its *ingegno*, **264–267**; marble carving, **258–261**; use of models, 49; visual representations of, 143–144. *See also* Leonardo da Vinci; Michelangelo; painting
- Segni, Bernardo, 9
- semplice corpo*, 329
- senso comune (sensus communis)*, 296, 301; Leonardo's concept of, 74–76
- Serlio, Sebastiano, 18, 26
- Sforza Court, 36, 294, 336, 356–357; celebrations, 35–36; Petrarchan poets at, 315–318; rivalry of the arts at, 40–42; Scholastic presence, 298

- Sforza, Duke Lodovico, 42, 162, 298, 336
- Shearman, John, xiv, 96
- Siena, Bernardino da, 68
- sight: *see* vision; optics; judgment of sense
- Silvestrius, Bernard, 294
- similitudes: *see* images
- Simonides, 93, 341, 342
- Spartaro, Giovanni, 353
- species: *see* images; Roger Bacon
- splendore*, 106, 110, 111, 345
- Studio Pavese, 330
- studiolo of Federigo da Montefeltro, 57, 58
- stupore*, 346
- superfitie* (surfaces), 178–179; identified with *disegno*, 226–227; and painting, 190–191, 228–229. *See also termini*
- symmetria*, 324
- Taccone, Baldassare, 35
- techne*, 120, 129, 132, 145
- tempo, 240–243, 248–249; definition of, 241 n. 117, 366
- tenzons*, 24, 39, 317, 337
- termini* (boundaries), 111–113, 176–177, 406, 411; defined as drawing, 184; and sculpted relief, 278–279; and the sculptor's procedures, 258–261. *See also* line; drawing; *superfitie*
- Tezio, Gerolamo, 57–59, 116
- theologica poetica*, 68
- theory and practice, 73–75; Daniele Barbaro on, 146–148; Leonardo on, 82–86. *See also* art; Leonardo da Vinci at scientific methods
- Thierry of Chartres, 324
- Thomas Aquinas, saint, 335, 346, 347; on artistic production, 141, 305–306; and Augustine, 327; on certitude, 65–66; on the classification of the sciences, 65–66, 290–291; on the *cogitativa*, 354; commentary on Aristotle, 65, 75; defines painting as a science, 65; definition of *scientia media*, 81; on discourse, 75; on nobility, 66, 73–76, 305–306, 335, 346–347; on phantasms, 305–306; on poetry, 66; on sight, 75; *Summa theologica*, 297
- Tibaldi, Pellegrino, 148; Annunciation relief, 149, 151
- Tinctoris, Johannes, 354, 363
- tonal composition, xiv, 49 n. 58, 96–97, 110, 114; compared to Petrarchan poetry, 45; and color, 132–133
- tonos*, 345
- Torre, Marcantonio della, 36, 81 n. 140, 90
- translatio*, 329
- “trattato sequences,” 414, 423
- Trattato*, 3, 405; Accolti's knowledge of, 30; Cigoli's knowledge of, 29–30; on *disegno*, 394, 398; four fundamentals of painting, 405; history of, 16, 27–31, 117–118; on *ingegno*, 398; Leonardo's plans for, 92, 163–166; organization of, 164; origin of the title, 3 n. 2; manuscript copies, 26–27, 51 n. 84; publication of, 16, 31, 118
- Urban VIII, Pope, 160
- ut pictura poesis*, 6, 34, 93, 383; music is the sister of painting, 240–241; painting is mute poetry, 206–207, 208–209, 214–215, 216–217; visual iconography of, 4 n. 6. *See also* painting
- Valla, Giorgio, 90, 290; on artistic and poetic imagination, 293; classification of the sciences, 64, 290; debt to Aristotle, 329; on *descriptio*, 330; *De expetendis et fugiendis rebus*, 64, 90, 309, 359, 377; theory of rhetorical invention, 345, 365; Varchi's knowledge of, 378
- Valla, Lorenzo, 67, 290, 385; definition of the liberal arts, 63–64; on rhetorical argumentation, 328–329, 358
- Valturio, Roberto, 331
- Varchi, Benedetto: classification of knowledge, 129–132, 138; on imitation, 304; on method, 89; questionnaire to artists, 19, 132; use of Galen, 378; writings, 62
- varietà*, 106, 110, 129, 315, 363, 369,

- 370, 412, **202–203**; of colors in painting, **284–285**; sculpture lacking in, **276–277**; in music, 363
- Vasari, Giorgio, 17, 49, 128, 143; and the Accademia del Disegno, 125; classification of the arts, 5; and the *Codex Urbinas*, 160; on *disegno*, 5, 20, 138–139; on Leonardo's wit, 317; *Lives*, 19–20, 127, 144–145; and Michelangelo's funeral, 19–20, 143–144; on the rivalry of painting and sculpture, 17–19, 49, 138; Palazzo Vecchio frescoes, 126
- Veneziano, Agostino: *Bandinelli's "Academy,"* 125
- Verrocchio, Antonio, 50, 318, 388; *Battle of the Nudes*, 50
- "Virgil's Academy," 35
- Virgil, 319, 322, 333
- virtus distinctiva*, 321, 339
- virtus impressa*, 193 n. 35, 302, 351. *See also impressiva/impressiva*
- virtù visiva*, 296, 309, 310, 325, 403
- virtù*, 309, 310
- Visconti, Gaspare, 42, 90, 337
- vision: Augustine on, 328, 350–351; Roger Bacon on, 310–311; Dante on, 75–76, 302; process of, 347–348; Leonardo's geometric demonstration of, 302–303; "fallacies" of, 106–107; functions of, 77; pupil dilation and imagination, 107–110; theories of, 311; problem of nocturnal vision, 311–312; and judgment, 321. *See also* discourse; eye, function of; optics; painting; Leonardo da Vinci
- visual arts: history of the category, 5–7
- Vitruvius, 83, 392; Alberti's revision of, 331, 336; *De architectura*, 85, 88, 146; on harmony and *ratio*, 324, 366; on landscape motifs, 319; Leonardo's debt to, 308, 362; on the nobility of nature, 381; Pacioli's debt to, 82, 362; on painting as a liberal art, 290
- vituperatio*, 33, 79
- Walker, Margaret, 169
- Weisheipl, John, 65 n. 96
- Witelo, 77, 291; *Optics*, 149
- Wittkower, Rudolf and Margot, 126
- ymaginatio*, 294
- Zaccolini, Matteo, 30–31, 411
- Zuccaro, Federico, 27, 129

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